Financing ARV Drug Manufacture in Zimbabwe: Implications for technological capability upgrading and innovation for African local pharmaceutical production

Thesis

Financing ARV Drug Manufacture in Zimbabwe: Implications for Technological Capability Upgrading and Innovation for African Local Pharmaceutical Production

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Abstract

Contemporary academic and professional discourses on local African pharmaceutical manufacture have concentrated on technology, technology transfer, economies of scale, human capital, and markets for drugs; neglecting the financing of working capital and capital investment, and the role played by banks. When finance is discussed, it is not discussed in depth and it is divorced from innovation and complexities surrounding financing of local African pharmaceutical manufacture. In this study, I investigated the financing of antiretroviral drugs (ARV) manufacture in Zimbabwe focusing on sources of finance for working capital requirements and capital investment to import technology. I also investigated technological capabilities surrounding access to finance and loan origination at pharmaceutical companies and banks respectively. Using a case study approach and multiple methods for data collection, I interviewed over 50 respondents from three Zimbabwean pharmaceutical companies, nine commercial banks, and one regional financial institution in addition to local and regional pharmaceutical manufacturers and policy makers in 2011. I used examination, tabulation, categorisation and testing of data using both quantitative and qualitative evidence for data analysis. In line with literature on Zimbabwean enterprise finance, banks provided working capital finance but not capital investment finance. Bank short-term finance in conformity with African finance literature was characterised by high interest rates, high interest spreads, and low lending. The politics of lending offered an additional explanation to adverse selection and moral hazard explanations for the low lending, high interest rates, and high interest spreads in Zimbabwe. Pharmaceutical companies financed capital investment and a portion of working capital with internal funds, compromising rapid technological capability upgrading and innovation. Dependence on internal resources to fund capital investment and technology imports was driven by lack of investment and project finance capability to access offshore loans; as local banks could not advance foreign currency long-term loans. The theoretical implications of this study point to the need to unravel an African context of the finance and innovation nexus surrounding technological capability upgrading and innovation in local African pharmaceutical manufacture.

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3TC: 2',3'-dideoxy-3'-thiacytidine (Lamuvidine)

ABC: Abacavir

AFC: Africa Finance Corporation

AfDB: The African Development Bank

Afreximbank: African Export-Import Bank

AIBST: African Institute of Biomedical Science & Technology

AIDS: Acquired Immunodeficiency Syndrome

ANDI: African Network for Drugs and Diagnostics Innovation

API: Active Pharmaceutical Ingredient

ART: Antiretroviral Treatment

ARV: Antiretroviral drug

ATV/r: Atazanavir/Ritonavir

AZT: azidothymidine (Zidovudine)

AU: African Union

CIF: Cost Insurance and Freight

CRO: Contract Research Organisation

d4T: 2'-3'-didehydro-2'-3'-dideoxythymidine (Stavudine)

DBSA: Development Bank of Southern Africa

ddI: 2',3'-dideoxyinosine (Didanosine)

DFID: Department For International Development

EAC: East African Community

EAC PMPOA: East African Community Pharmaceutical Manufacturing Plan of Action

EFZ: Efavirenz

ESAP: Economic Structural Adjustment Programme

ERF: Export Revolving Fund

EU: European Union

FDI: Foreign Direct Investment

FTC: Emtricitabine

FTC: Firm level technological capability

GPA: Global Political Agreement

GDP: Gross Domestic Product

GIZ: German International Cooperation

HIV: Human Immunovirus

HVAC: Heating Ventilation and Air Conditioning

IDB: Industrial Development Bank

IDB: Industrial Development Bureau

IDV: Indinavir

IFC: International Finance Corporation

IMF: International Monetary Fund

LC: Letter of Credit

LPV/r: Lopinavir/Ritonavir

MCAZ: Medicines Control Authority of Zimbabwe

MD: Managing Director

MDC: Movement for Democratic Change

MNC: Multinational Corporate

MTDP: Medium Term Development Plan

NAC: National Aids Council

NECF: National Economic Consultative Forum

NEPAD: New Partnership for African Development

NFI: Non-Funded Income

NGO: Non-Governmental Organisation

NSI: National Systems of Innovation

NTC: National level technological capability

NVP: Nevirapine

OGIL: Open General Import Licence

PAAB: Public Accountants and Auditors Board

p.a.: per annum

PEPFAR: President's Emergency Plan For AIDS Relief

PTA Bank: Eastern and Southern Africa African Trade and Development Bank

R&D: Research and Development

RBZ: Reserve Bank of Zimbabwe

RIWAC: Risk Weight Adjusted Capital

RPED: Regional Program on Enterprise Development

RTV: Ritonavir

SADC: Southern Africa Development Community

SME: Small to medium enterprises

STERP: Short Term Economic Recovery Plan

TB: Tuberculosis

TDF: Tenofovir disoproxil fumarate

TRIPS: Trade Related Aspects of Intellectual Property Rights

UDI: Unilateral Declaration of Independence

UK: United Kingdom

UN: United Nations

UNCTAD: United Nations Conference on Trade and Development

UNDP: United Nations Development Programme

UNICEF: United Nations Children's Fund

UNIDO: United Nations Industrial Development Organisation

USA: United States of America

USD: United States Dollar

VAT: Value added tax

WB: World Bank

WHO: World Health Organisation

WWII: Second World War

ZANU PF: Zimbabwe African National Union Patriotic Front

ZDB: Zimbabwe Development Bank

ZDV: azidothymidine (Zidovudine)

ZETRAF: Zimbabwe Economic and Trade Revival Facility

ZIDP: Zimbabwe Industrial Development Plan

Chapter 1: Financing Local Pharmaceutical Production in Africa: The elephant in the room!

1.0 What is the Big Story?

Many sub-Saharan African countries face a real and present global health crisis because of an un-proportionally high disease burden, high prevalence of neglected diseases, lack of access to medicines, importation of more than 90% of medicines and a general continental unpreparedness for epidemics (Africa Health Strategy, 2007; AU, 2007; WHO, 2005). For example, when there was a global flu pandemic threat in 2009, there were no plans or provisions for manufacture of vaccines for the African population, and if the pandemic had materialised in Africa the results would have been disastrous (ANDI delegate, 2011[1]). Turning to the issue of HIV/AIDS, as at 2010, Zimbabwe had a population of 1.3 million living with HIV of which, 640 000 needed to be on antiretroviral drug treatment (NAC, 2010). The number of children orphaned due to unnecessary HIV/AIDS related deaths stood at 1 million in 2008[2], emphasising the urgency of access to antiretroviral treatment in Zimbabwe.

The African health crisis is further exacerbated by the general low footprint and impact of local pharmaceutical production and innovation on Africa's medicines supply challenges (Africa Health Strategy, 2007; AU, 2007; WHO, 2005). To date many initiatives addressing the African medicines supply challenge come from the north; from a technology, and innovation perspective, as well as institutional innovations (social technologies) which gave rise to brokers and facilitators such as product development partnerships that are addressing access to medicine and innovation of health technologies for neglected diseases (Chataway *et al.*, 2010). Given this background, it is not surprising that African local pharmaceutical manufacture has experienced a resurgence in recent years spearheaded by pan-African organisations such as AU (African Union), NEPAD (New

[1] I interacted with this global health expert at the ANDI conference in Ethiopia in 2011.
[2] http://www.avert.org/africa-hiv-aids-statistics.htm accessed 28 August, 2010

Partnership for Africa's Development) as well as regional economic bodies such as SADC (Southern Africa Development Committee) and EAC (East African Community) (Africa Health Strategy, 2007; AU, 2007; EAC PMPOA, 2011).

The sub-Saharan African pharmaceutical industry however, is predominantly at the low end of the value chain, importing all active pharmaceutical ingredients (APIs) and involved mainly in formulation and packaging activities except for companies in Ghana and South Africa which locally manufacture APIs (Kaplan and Laing, 2005; Mohammed, 2009). Consequently, calls for local production of drugs in Africa has met with mixed reactions and heated arguments based on technological capability, feasibility and economies of scale (Kaplan and Laing, 2005; Mohammed, 2009; Rovira, 2006; Seiter, 2005; Turshen, 2001; UNIDO, 2010a, 2010b, 2011b, 2011b; Wilson *et al.*, 2012). One school of thought argues that local pharmaceutical manufacture is good for Africa and should be encouraged from a health systems strengthening position, self-sufficiency, preparedness for epidemics, industrial development, economic growth, stimulating technological capability upgrading and innovation (see for example Bates, 2008; Mohammed, 2009; UNIDO 2011b). Another group argues that many African country contexts, except a few major economies, lack economies of scale, human capital and technological capabilities, while supply and demand dynamics do not support such a heavy investment in local manufacture. As such import of cheap medicines and supply are key issues that need to be addressed (see for example Kaplan and Laing, 2005).

Literature that advocates for promotion of local pharmaceutical manufacturing in Africa has to date focused on technology, technology transfer, human capital, markets for drugs, and economies of scale (AU, 2007, Bates, 2008; EAC PMPOA, 2011; Kaplan and Laing, 2005; Mohammed, 2009; UNIDO, 2010a, 2010b, 2011a, 2011b) ignoring an in-depth analysis of complexities surrounding the financing of local drug manufacture. When finance is mentioned it is in passing lacking a detailed analysis. Chataway *et al.*, (2009) when discussing technological trends and opportunities to combat diseases for the poor argued that scientific and technological breakthroughs and useful

innovations do not automatically translate to accessibility to the public; but African governments, industry, the international community and civil society need to purposively resolve funding, regulation, production and delivery issues. The recognition that finance is important for translation of breakthroughs into accessible health technologies reflects the focus on the need to understand complexities surrounding financing local pharmaceutical manufacture and sources of finance for industrial development and technological capability upgrading. These sources of finance may include government, foreign direct investors, banks, venture capitalists or development financial institutions (see chapter 3).

Contemporary debates by policy makers, industry players and agencies promoting African local pharmaceutical manufacture have focused on innovation, technology, technology transfer, economies of scale, markets for drugs and human capital whilst ignoring the critical subject of financing local drug manufacture. This is what I refer to as the "elephant in the room". In-depth analysis of firm level technological capabilities required by African pharmaceutical companies to access finance for working capital requirements and acquiring plant, equipment and machinery is lacking in contemporary literature on African pharmaceutical manufacture. Further to this, an in-depth analysis of capabilities required by African financial institutions to prospect for viable projects to fund, carry out credit risk assessment and management, and monitoring and control of disbursed loans is scarce in African literature on banking and finance. This is in spite of the universal identification of access to finance, especially long term loans, to import plant, equipment and machinery as one of the major hurdles to African pharmaceutical industry development and innovation take off (Africa Health Strategy, 2007; AU, 2007; EAC PMPOA, 2011; Kaplan and Laing, 2005; Mohammed, 2009; UNIDO, 2007, 2010a, 2010b, 2011a, 2011b). Contemporary discourses either ignore or pay cursory attention to; who will finance, how they will finance and why they will finance African local pharmaceutical manufacture in that particular way. This study seeks to contribute towards filling this gap in knowledge.

I argue that the "elephant in the room" on financing African local pharmaceutical production debates is that it is not as simple as going to the bank or financier and getting money for day to day operations and importing plant, equipment and machinery. Contemporary discourses also ignore the link between finance and innovation. Some innovation thinkers, for example Mytelka (2003) and Christensen (1992) pointed out the link between finance and innovation, but this was more in general discourse about dynamics for catch up and the role of finance in national systems of innovation. What is glaringly apparent though is the lack of in-depth empirically backed discussions and analyses on the complexity surrounding financing local pharmaceutical production in Africa, and the link between finance and innovation. There are complexities surrounding access to finance by pharmaceutical companies for importing technology that can result in technological capability upgrading. For pharmaceutical companies to access finance there are capabilities and technical competencies required such as investment and project finance underpinned by knowledge and experience (see chapters 5, 6 and 7). The same argument stands for financiers where there are intricate capabilities and technical competencies required such as prospecting for viable projects, project finance appraisal, managing lending technologies, credit risk analysis, credit risk management, loan documentation, loan advance, and loan monitoring and control (see chapters 3, 5 and 6). I also argue that some of the ignored complexities surrounding financing local pharmaceutical manufacture are bank institutional factors. The bank institutional behaviours constituting the politics of lending drive preference for lending to multinational corporates and their subsidiaries over local companies. These institutional factors also push for a preference for transactional banking over traditional lending as a key source of revenue for the business. These bank institutional behavioural characteristics driven by bank ownership, credit policies, underwriting standards, revenue generation strategies have to date been ignored in contemporary discourses (see chapter 6). Finally, I argue that there are policy and practice gridlocks, emanating from national technological capability failure and policy conflict that cause firms to invest in alternative infrastructure as a compensatory strategy.

I set up the rest of the chapter as follows: in section 1.1, I discuss the gap in knowledge, followed by my decision to focus on Zimbabwe in section 1.2. I discuss the research questions in section 1.3, and in section 1.4, I present briefly the theoretical framework. I discuss the objectives of the study in section 1.5 followed by what this study contributes to knowledge in section 1.6. I focus on the relevance of the study to African pharmaceutical manufacturing in section 1.7 and conclude with section 1.8.

1.1 Where is the Gap in Knowledge?

As discussed earlier contemporary innovation, industrial development and technological capabilities studies and literature on African pharmaceutical manufacturing focus on technology, technological capabilities, technology transfer, human skills and economies of scale (Anderson, 2010; Bates, 2008; Kaplan and Laing, 2005, Rovira, 2006; UNCTAD, 2011; UNIDO 2010a, 2010b, 2011a, 2011b; Wilson *et al.*, 2012). This body of literature ignores the critical cog of finance and its link to innovation and ultimately industrial development in Africa. African finance literature addresses lending issues and the challenges faced in enterprise financing. In general it focuses on the prevalence of high interest rates, high interest spreads and high incidence of moral hazard and adverse selection (Andrianova *et al*, 2010, 2011a, 2011b; Aryeetey *et al.*, 1997; Beck and Hesse, 2009; Beck *et al.*, 2009, 2011; Nissanke, 2001; Sacerdoti, 2005). This literature is useful in illuminating the enterprise financing terrain. However, it does not focus on the financing of the pharmaceutical sector, the link between finance and technological capability upgrading and innovation. It also does not address the complexities surrounding seeking and giving finance as discussed earlier and thus does not delve into the politics of lending. Innovation literature on African pharmaceutical production covers the technological aspects of production and mentions finance as a major hurdle (Anderson, 2010; Bates, 2008; Kaplan and Laing, 2005, Rovira, 2006; UNCTAD, 2011; UNIDO 2010a, 2010b, 2011a, 2011b; Wilson *et al.*, 2012). However, and this is the major gap in knowledge; there is no literature that purposively addresses the link between finance and technological capability upgrading and innovation in local pharmaceutical manufacture

in Africa, considering and analysing the politics behind lending and banking activities, and the interactions between firms and banks at firm level.

I elaborate on the complexity of financing local pharmaceutical manufacture ignored in contemporary discourses in Fig 1 below. I developed the framework using ideas on technological capabilities (Lall, 1992), and the role of banks as key economic units adding value to borrowers as they deal with and manage risk (Berger and Black, 2011; Allen and Santomero, 1997, 2001; Scholtens and van Wensveen, 2000, 2003) and my practice experience as a banker and data from the field. I discuss the theoretical framework in detail in chapter 3. In analyses of pharmaceutical companies' firm level technological capabilities, investment and project finance capabilities have been ignored. The top phase of Fig 1 illustrates this argument. The capability of the project finance team, especially the finance function to link with and leverage interactions and knowledge from engineering, production, quality control, research and development and procurement functions to produce a robust project finance proposal for the financiers (see Fig 1), I argue is lacking in discourses on financing local pharmaceutical manufacturing in Africa. These technical competencies cannot be taken as a given.

The same gap in knowledge exists with respect to financial institutions. There are technological capabilities required by relationship managers, credit risk managers, approvers, and regulators as they use lending technologies, investment capabilities and linkage capabilities in assessing credit proposals, advancing loans, and monitoring and controlling companies (see chapters 3, 6 and 8). The process of credit risk management, where the team assesses business risk, industry risk, management risk and country risk amongst other risks (as shown in Fig 1), is complex. There are technological capabilities embedded in interactions with institutional policies on credit, underwriting standards, revenue generation streams, client preference amongst other factors that drive the politics of lending. This is the gap in knowledge with respect to financial institutions and the complexities ignored in debates on local pharmaceutical manufacture, where only casual mention of finance as a hurdle to local drug manufacture is made.

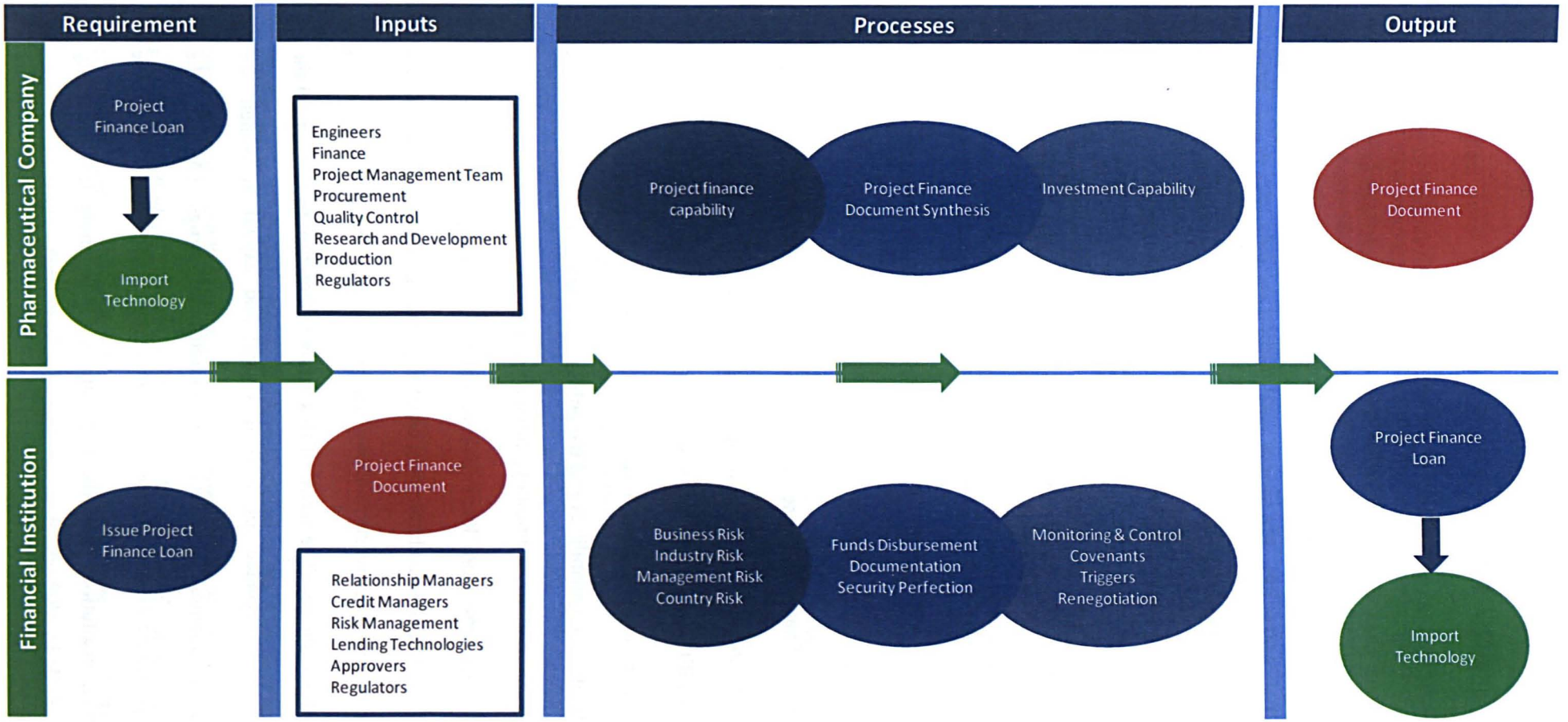


Figure 1: Complexity surrounding financing local pharmaceutical manufacturing.

Source: Developed by author with ideas from Lall (1992); Berger and Udell (2002); Allen and Santomero (1997, 2001); Scholtens and van Wensveen (2000, 2003); Fieldwork (2011)

From an innovation perspective to unravel some of the complexities involved in financing local pharmaceutical manufacture, I follow Lall's (1992) definition of firm level technological capabilities. He proposed that technological capabilities were made up of investment capabilities, production capabilities and linkage capabilities. Investment capabilities were defined as "the skills needed to identify, prepare, obtain technology for, design, construct, equip, staff and commission a new facility (or expansion)" (Lall, 1992:168). Production capabilities were defined as "range from basic skills such as quality control, operation, and maintenance to more advanced ones such as adaptation, improvement, or equipment stretching to the most demanding ones of research, design, and innovation" (Lall, 1992:168). And he defined linkage capabilities as "the skills needed to transmit information, skills and technology to, and receive them from, component or raw material suppliers, subcontractors, consultants, service firms, and technology institutions" (Lall, 1992:168).

In contributing to knowledge on the identified gap, I focus on finance and technological capabilities surrounding access to finance, because in the link between finance and innovation, finance can serve as both a lubricant and fuel determining the success of ventures in part and the velocity of technological capability upgrading, innovation and industrial development of the pharmaceutical sector. Whilst I acknowledge that finance is not the panacea, I argue that finance; project finance, attendant technological capabilities and the politics of lending are key components that need to be analysed in addition to technology, human capital, technology transfer and innovation in contemporary discourses on local pharmaceutical manufacturing in Africa. Admittedly, finance is part of an integrated technological capability and innovation system, but its importance and neglect, and the complexity surrounding accessing finance to date warrants a separate in-depth analysis in this instance. The thrust of this thesis is therefore to understand the following: the sources and cost of finance for working capital and capital investment for Zimbabwean pharmaceutical companies manufacturing antiretroviral drugs (ARVs); the technological capabilities at pharmaceutical companies and banks key to accessing finance; the politics of lending in financial institutions, and the implications for technological capability upgrading and innovation.

1.2 Focus of the Study

Firstly, I look at sources of finance; who provides finance; how they provide the finance and why they are the providers of the finance for local ARV drug manufacture in Zimbabwe. In this study, I split finance into working capital and capital investment finance. Secondly, I focus on the complexities surrounding finance at the pharmaceutical company and at the commercial bank. For the pharmaceutical company I focus on Lall's (1992) firm level technological capabilities matrix covering investment capability made up of pre-investment and project execution, and I add project finance capability (see chapter 3 and 5). For the commercial bank, I focus on technical competencies, skills and knowledge involved in prospecting, project appraisal, credit risk assessment and management, loan disbursement, and monitoring and control activities. I also focus on how commercial banks' strategies on revenue streams and how this affects lending. At national level, I follow Lall's (1992) national level technological capability framework to focus on business and environmental factors that affect operations of pharmaceutical companies and commercial banks.

1.2.1 Why Zimbabwe and ARV manufacture?

In this section I discuss why I chose Zimbabwe as the country of study and specifically ARV drug manufacture.

Zimbabwe in 1990 was, after South Africa, touted as the African country with potential to become the next newly industrialising country because it had an established and vibrant manufacturing sector (Pangeti *et al.*, 2000; Phimister, 2000; Riddell, 1990; Stoneman, 1990). Zimbabwe is a clear counterexample to the argument that African countries do not have the capability to locally manufacture drugs. Zimbabwe is capable of producing 50% of all drugs on the essential drugs list,

and if all formulation and development activities are taken into account then the capability rises to supplying 75% of all national medicines on the essential drugs list (NECF, 2011). In the case of local ARV manufacture, Zimbabwe was one of the first African countries to use the compulsory route to effect local production of ARVs for public use (Osewe *et al.*, 2008; UNIDO, 2011b) to address the HIV/AIDS pandemic. The country's use of the compulsory route accelerated local manufacture of ARVs (antiretroviral drugs) in 2003 demonstrating the political will, policy infrastructure and local pharmaceutical manufacturing capability (Osewe *et al.*, 2008; UNIDO, 2007; UNIDO, 2011b). Demonstrating a policy and practice willingness to support the local industry, the government promised to procure 75% of all ARV production for the public health system, with the balance of 25% exported to raise foreign currency for the company (Osewe *et al.*, 2008; UNIDO, 2007; UNIDO, 2011b).

The Zimbabwean pharmaceutical industry was set up in 1953, (UN, 1980a, 1980b, 1980c; UNIDO, 2007; UNIDO 2011b) giving almost 60 years to allow for technological capability upgrading, product and process innovation and vertical integration. The reality though is that the pharmaceutical industry in the 60 years it has been in existence has not exhibited a remarkable technological capability upgrading effort or product and process innovation or vertical integration to venture into primary production of drugs or intermediates (Osewe et al., 2008; UNIDO, 2007; UNIDO, 2011b). The pharmaceutical activity has remained mainly in secondary manufacture and highly dependent on imports of key raw materials such as active pharmaceutical ingredients and excipients (Osewe et al., 2008; UNIDO, 2007; UNIDO, 2011b).

In spite of the early promises in the 1990s of being the next newly industrialising country, the dream however, did not materialise. Zimbabwe thus represents a country that has fallen back on the earlier industrial gains achieved as early as the 1960s to 1980s (Pangeti *et al.*, 2000; Phimister, 2000; Riddell, 1990; Stoneman, 1990). Zimbabwe; a country emerging from a hyperinflationary era as a case study presents an interesting but complex candidate to study the financing of local pharmaceutical manufacture, in this case ARVs. As a case study, Zimbabwe has the potential to

precipitate and surface many issues, all at once, about what can go wrong in an economy with a once vibrant pharmaceutical industry that gave the government confidence to issue a compulsory license for local manufacture of ARVs. Zimbabwe can be used as a microcosm with an accelerated window to study the myriad of challenges that African countries can face in financing local pharmaceutical manufacture.

Building on the fact that Zimbabwe can surface many issues all at once pertaining to financing local manufacture of ARVs, Zimbabwe is also interesting to study because it went through three dramatic politico-economic eras (Mutenheri and Green, 2002; Phimister, 2000). First it went through the federation era followed by unilateral declaration of independence (1965-1979) and had sanctions imposed during that period (Mutenheri and Green, 2002; Phimister, 2000). Secondly, the first decade of independence (1980 -1990) was characterised by a closed economy followed by economic structural adjustment programmes of 1991 that led to liberalisation of financial markets and concomitant de-industrialisation (Mutenheri and Green, 2002; Phimister, 2000). Finally, the country went through the politico-economic challenges of 2000 to 2009 accompanied by hyperinflation, international isolation, financial dis-intermediation, and scarcity of foreign currency and long-term finance (Mutenheri and Green, 2002; Phimister, 2000). An analysis of the challenges faced by the Zimbabwean pharmaceutical industry in financing local manufacture considering this background brings out nuances peculiar to Zimbabwe. As such, some of the challenges to financing local manufacturing of ARVs may be particular to Zimbabwe with its idiosyncrasies. However, there are lessons that may have universal appeal that other African countries and indeed other developing countries can learn from Zimbabwe.

1.3 Research Questions

As argued earlier, finance is one of the major requirements for any project to succeed. As such focusing on who provides capital, how they provide the capital (lending technologies and politics

of lending) and at what premium (price in the form of interest and other fees) helps in advancing an understanding of finance as one important factor, often neglected that can drive technological capability upgrading and innovation.

The main research question for the study was: **How is local manufacture of ARVs in Zimbabwe financed and what are the complexities and technological capabilities surrounding its financing?**

By necessity I split the type of financing into working capital finance (financing day to day operations of an enterprise) and capital investment finance, which covers core working capital requirements and acquisition of plant, machinery and equipment (capital investment/fixed investment).

1.3.1 Sub-research questions

In order to unravel the complexity surrounding financing of ARV manufacture in Zimbabwe I then split up the main research question into five sub-research questions as follows:

Research question 1: How are capital investment and working capital requirements for ARV research and development, and manufacture financed?

Research question 2: As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?

Research question 3: At firm level, what technological capabilities are required for pharmaceutical companies to access finance and the expertise and capabilities at banks required for loan origination?

Research question 4: What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?

Research question 5: What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?

1.4 Theoretical Framework

I am focusing on the link between finance and innovation, specifically technological capability upgrading that can result in product and process innovation after acquisition and importation of capital equipment; the hardware component of technology. I used an eclectic synthesis of economic, social, and financial history linked to finance, corporate finance theory, contemporary banking and financial intermediation theories as well as innovation literature on technological capability framework. In order to build the theoretical framework I looked at historical sources of finance for enterprises, and used pecking order theory to understand how companies decide to use which form of finance. Banks emerged as the most prevalent source of external finance, thus I looked at contemporary banking and financial intermediation theory to understand what banks do and how they do it. The link with innovation came through Lall's (1992) technological capability framework as well as Ernst and Lundvall's (1997) knowing and learning aspect of innovation covering the know-who, know-how and know-why aspects of knowledge.

1.5 Objectives of the Study

The objective of the study was to understand how local ARV manufacture was financed; the sources of finance for capital investment for importing machinery and equipment; the hardware of technology and the sources of finance for working capital finance (see chapters 5, 6 and 8). Another objective of the study was to unravel the complexities and technological capabilities

surrounding financing local manufacture of ARVs in Zimbabwe by looking at firm level technological capabilities at the pharmaceutical company involved in accessing finance, as well as the firm level technological capabilities at the bank involved in assessing projects and loan advances (see chapters 5, 6 and 8). The third objective was to understand the politics of lending, in the interaction between banks and pharmaceutical companies and understand how this affects access to finance for local pharmaceutical companies (see chapters 6 and 8). The fourth objective was to understand how failure of technological capability at national level could elicit a compensatory response at firm level with investment in alternative infrastructure and thus causing policy and practice gridlocks manifesting as business and operating environmental hurdles (see chapter 7). In order to achieve these objectives, I carried out a case study of the financing of ARV manufacture in Zimbabwe using a finance lens, within an innovation and technological capability framework to tease out the relationship between finance and innovation and the role played by banks in technological capability upgrading and industrial development in the Zimbabwean pharmaceutical industry.

1.6 Contribution to Knowledge

My contribution to knowledge is from both an empirical and theoretical basis. Empirically my contribution to knowledge comes from the novelty of the study, which links finance and innovation by considering the technological capability complexities surrounding financing of local manufacture at the pharmaceutical company and the bank. The other empirical contribution comes from the study considering the role played by commercial banks in technological capability upgrading and innovation for local pharmaceutical manufacturing in an African context (see chapters 5, 6, 7 and 8). To the best of my knowledge, this is the first study of this kind in Zimbabwe and in Africa.

From a theoretical basis, my contribution to knowledge lies firstly in the modification of Lall's (1992) firm level technological capability framework to include project finance capability (see chapter 3). Lall (1992) may broadly have classified this ability under investment but I argue that it is of importance and needs to stand-alone but linked to investment capability. My second theoretical contribution to knowledge is the politics of lending explanation on low lending in Africa, accompanied by high interest rates and high interest spreads. These to date have been explained using only moral hazard and adverse selection explanations (see chapter 6 and 8).

1.7 Relevance of Study to Africa and African Pharmaceutical Manufacture

The research informs broader policy and practice debates on financing of local pharmaceutical manufacture in African contexts. It also explores challenges to financing technological capability upgrading and innovation in the African pharmaceutical industry. The findings have broad practice and policy implications at two levels.

1. First, relevance of the study comes from its surfacing of the implications of the technological capabilities surrounding finance and project finance capability for industrial development and innovation. It focuses on the challenges, the politics of lending, and the dynamics of financing technological advance and what needs to be addressed to unlock latent potential.

2. Second, focusing on policy and practice, the discussion on the politics of lending and policy and practice gridlocks unravels some up to now unincorporated issues for consideration and discussion in local pharmaceutical manufacturing debates in Africa. The raising of the implications of the politics of lending and policy and practice gridlocks driven by national financial architectures is timely for national and continental debates. Especially so considering local pharmaceutical manufacture programmes being promoted by the African Union (AU), Southern Africa Development Corporation (SADC), African Network for Drugs and Diagnostics Innovation (ANDI), Southern Africa Generics

Manufacturers Association, East Africa Pharmaceutical Manufacturing Plan of Action group, West Africa Pharmaceutical Manufacturing Association and the Federation of African Manufacturers Association initiatives, to mention a few.

Whilst I acknowledge that Zimbabwe may have peculiar economic, macroeconomic and political circumstances; the findings however, at strategic, policy and practice levels are relevant for strategy and policy formulation on financing technological capability upgrading and industrial development of the pharmaceutical sector in Africa in general. As mentioned earlier, the Zimbabwean situation precipitates rapidly factors and actors needed to address financing of local manufacture of pharmaceuticals in a developing country context. The whole thrust is on financing technological capability upgrading and innovation and at a theoretical level there is relevance in the Zimbabwean experience for other African countries.

As mentioned earlier, Zimbabwe's pharmaceutical manufacturing industry was established as early as 1953 and the country's health system was historically less dependent on imported drugs (Turshen, 2001). To date the industry is capable of supplying 50% of the country's essential drugs rising to 75% if formulations under development are taken into consideration (UNIDO, 2011b). As such the Zimbabwean pharmaceutical industry presents an opportunity to study an industry that prior to the economic downturn of the 2000s was successfully supplying a huge portion of local health system drug requirements. The policy and support mechanisms that the country used to nurture and grow the pharmaceutical industry can provide other African countries with policy and practice lessons. Zimbabwe was also the first African country to use the compulsory licensing route to locally manufacture ARVs for the public health system and therefore stands to give lessons that other countries can learn from the ARV manufacturing trajectory.

1.8 Structure of Thesis

The rest of the thesis is set up as follows: **Chapter 2** gives the background to Zimbabwe's political economy, secondary manufacturing, the pharmaceutical manufacturing sector, financial systems and historically, how industrialisation was financed. This chapter gives context to the Zimbabwe situation. Chapter 2 also reviews literature on African financial systems and pharmaceutical manufacturing. **Chapter 3** is the second portion of literature review that focuses on building the theoretical framework that I used in this study. In **Chapter 4,** I present the methodology and methods I used to carry out this study, discussing the case study approach and multiple-methods for data collection, as well as analysis of the data. In **Chapter 5,** I discuss, using a finance lens within an innovation and technological capability framework, the business of ARV manufacture covering procurement, research and development, production, and marketing of ARVs. I look at the sources and cost of finance for working capital requirements (including trade credit) and capital investment. In **Chapter 6** I analyse the role of banks in financing ARV manufacture in Zimbabwe, technological capabilities involved in lending, the politics of lending as embodied in credit policies, underwriting standards and institutional behaviour. I explore the determinants of allocation of credit to pharmaceutical companies and current sources of finance for working capital and capital investment. In **Chapter 7,** I explore the business and operating environment within which the financial institutions and the pharmaceutical companies operate. Using the technological capability framework of Lall (1992) I discuss how national technological capabilities drive the business and operating environment, and how failure at national technological capability level drive a compensatory response at company level technological capability resulting in policy and practice gridlocks and how firm level investment results in alternative infrastructure further driving up the cost of doing business. In **Chapter 8,** I analyse the empirical findings from chapter 5, 6 and 7 addressing the research questions. In **chapter 9,** I discuss the significance of the results in light of the argument advanced in chapter 1 about financing of local pharmaceutical manufacture being ignored in contemporary discourses. I discuss the findings of the study; what they contribute to knowledge and what the implications for African local pharmaceutical manufacture and

technological capability are. I conclude the chapter by pointing at further opportunities for research and some policy recommendations.

Chapter 2: Background to Zimbabwe: Tracing Key Events

2.0 Introduction

In chapter 1, I discussed how academic and professional debates on local pharmaceutical manufacturing in Africa neglect the complex issue of financing local pharmaceutical manufacture. I pointed out the complexity surrounding financing local pharmaceutical manufacture and argued that it is not just about money but there are technological capabilities, lending technologies, skills and expertise, politics of lending and policy and practice gridlocks involved. In this chapter, I discuss the political economy, manufacturing, banking and pharmaceutical production context for Zimbabwe. I also discuss African financial systems and pharmaceutical manufacturing. I set up the chapter as follows: in section 2.1, I discuss local pharmaceutical manufacture, and African pharmaceutical manufacture in section 2.2. In section 2.3, I discuss African financial systems, which leads into a discussion on the background to Zimbabwe's political economy in section 2.4. I move on to the rise of manufacturing in section 2.5 and the country's financial architecture in section 2.6. In section 2.7, I discuss financing Zimbabwean enterprises and industrial development. Zimbabwe's pharmaceutical manufacturing landscape is the subject of discussion in section 2.8 and I present the story of local antiretroviral manufacturing in Zimbabwe in section 2.9. I conclude the chapter with section 2.8.

2.1 Local Pharmaceutical Manufacture

In this section, I discuss some of the discourses about what local pharmaceutical manufacture is and nuances from economic, social, political, and policy arenas. African local pharmaceutical manufacture draws in issues of economic development, industrial development, industrial policy, trade policy, and global health to mention a few (UNIDO, 2011b). At the core of the African local pharmaceutical manufacturing argument is the issue of increasing local supplies of drugs for the public health system and lowering cost of medicines. Other arguments encompass self-sufficiency,

disaster preparedness, economic growth and industrial development (Africa Health Strategy, 2007; Anderson, 2010; AU, 2007; Bates, 2008; Rovira, 2006; UNCTAD, 2011; Wilson *et al.*, 2012). From the demand side, the rise in global health donor funding has increased markets for drugs, especially ARVs, antimalarials and TB (tuberculosis) drugs and has acted as a pull factor for local pharmaceutical manufacture in Africa (Rovira, 2006; UNIDO 2010a, 2010b, 2011a, 2011b). Supplying medicines to global health donor funded programmes however came with complications of expensive multiple regulatory approvals. For example WHO-prequalification is a key requirement for donor funded programmes and it comes with increased costs for local companies.

Local drug manufacture in Africa is complex and can involve multiple actors at firm, national, regional and international policy, practice and strategic levels (UNIDO, 2010a, 2010b, 2011a, 2011b). As mentioned earlier local pharmaceutical manufacturing discourses span global health, access to medicines, neglected diseases, industrial development, economic development and social development debates (Bates, 2008; Kaplan and Laing, 2005; Turshen, 2001, Nwaka *et al.*, 2012). At national level, local drug manufacturing, reflective of general manufacturing issues pans out into policy and practice domains of incentives, capability, and institutions (Lall, 1992; UNIDO, 2010a, 2010b, 2011a, 2011b; Wade, 2009). Local pharmaceutical manufacturing in Africa is about policy and practice paradigms of institutional innovation, national systems of innovation, technological capabilities, drug regulation and harmonisation translating into health technologies and innovations that benefit the poor (Chataway *et al.*, 2009; Lall, 1992; UNIDO, 2010a, 2010b, 2011a, 2011b). Local pharmaceutical manufacture is also about developing countries' industrial catch up, government's role in protecting nascent industry and technological effort (Christensen, 1992; Mytelka, 2003; Wade, 2009). Advocates of local drug production argue that local manufacture is about Africa determining its health technologies innovation strategies and medicines supply (Africa Health Strategy, 2007; Anderson, 2010; AU, 2007; Nwaka *et al.*, 2012; UNCTAD, 2011). Local pharmaceutical manufacture in Africa is also about leveraging efforts by African governments and pan African institutions such as the African Network for Drugs and Diagnostics Innovation (ANDI) to coordinate drugs, diagnostics and vaccine innovation

capabilities on the continent to solve the disproportionately high disease burden on the continent (Nwaka *et al.*, 2012).

2.2 African Pharmaceutical Manufacturing

In the preceding section, I discussed local pharmaceutical manufacture. In this section, I discuss sub-Saharan African pharmaceutical manufacturing to build a more comprehensive picture.

The global pharmaceutical industry is complex, and highly dynamic, characterized by high research and development (R&D) expenditures and extensive regulation of products compared to other manufacturing industries (Berger *et al*; 2009; Kaplan and Laing, 2005; Rovira, 2006). However, African pharmaceutical companies are mostly involved in generics manufacture and limited to formulation activities only except for Ghana and South Africa to some extent (Berger *et al.*, 2009; Kaplan and Laing, 2005; UNIDO 2011b). Data on pharmaceutical manufacturing on the continent is scarce and fragmented (Berger et al., 2009; Kaplan and Laing, 2005; UNIDO 2011b). However, UNIDO, GIZ and NEPAD have made efforts to build knowledge of the manufacturing capabilities on the continent; and this study benefitted immensely from these studies (Berger *et al.*, 2009; EAC PMPOA, 2011; UNIDO, 2010a, 2010b, 2011a, 2011b). To date, UNIDO has published pharmaceutical manufacturing capabilities scans for Nigeria, Kenya, Uganda and Zimbabwean (UNIDO, 2007, 2010a, 2010b, 2011a, 2011b). In East Africa, GIZ, the Germany development agency in conjunction with the East African Community mapped out the manufacturing capabilities of Rwanda, Burundi, Tanzania, Kenya and Uganda (EACPMPOA, 2011; GIZ, 2007a, 2007b). Of these five countries, the major manufacturing companies are in Kenya, Tanzania and Uganda (EACPMPOA, 2011; GIZ, 2007a, 2007b).

Thirty seven of the fifty six African countries possess some pharmaceutical manufacturing capability with as mentioned earlier, South Africa and Ghana the only countries in sub-Saharan

Africa with limited production of active pharmaceutical ingredient (API) and intermediates (Berger *et* al, 2009; GTZ, 2007a, 2007b; IFC, 2008; Kaplan and Laing, 2005; UNCTAD, 2011; UNIDO, 2010a, 2010b, 2011a, 2011b). Production of pharmaceuticals in Africa is heavily reliant on imported active pharmaceutical ingredients (APIs) and excipients from India and China (UNIDO, 2010a, 2010b, 2011a, 2011b). The local pharmaceutical manufacturing companies serve a small proportion of their population and hence the arguments on unattainability of economies of scale (Berger *et* al, 2009; Kaplan and Laing, 2005; UNCTAD, 2011; WHO, 2005, 2011).

Africa's share of medicines production has continued to decline and current efforts to increase local manufacture are a response to this decline (WHO, 2005). The African Union (AU, 2007 and Berger *et al*, 2009) argue that there is a business case for local drug manufacture, but recognised that some countries might have neither the capacity nor capability to go it alone. NEPAD also recognised this limitation in devising the Strengthening Pharmaceutical Innovation in Africa strategy (Berger *et al.*, 2009). NEPAD acknowledged that countries are at different levels of pharmaceutical manufacturing capability and proposed a phased approach to localisation of drug production (ibid). Countries at advanced stages would be encouraged to go for local production while the resource poor countries would be encouraged to aim for access strategies (ibid). UNCTAD (2011) also gave policy guidelines to policy makers and investment promotion agencies for local pharmaceutical manufacturing. However, what is missing from these strategies and policy recommendations is who will finance local pharmaceutical manufacture, and how they manage the complexities involved in financing technological capability upgrading and innovation.

In the next section, I discuss African financial systems to give context to the financial architecture in sub-Saharan Africa.

2.3 African Financial Systems

In section 2.2, I briefly discussed pharmaceutical manufacturing in Africa. The industry is dispersed and spread throughout the continent but, data is scant and the majority of pharmaceutical manufacturing plants are privately owned, and involved in secondary and tertiary drug manufacturing activities. Of the strategies advanced by African regional bodies[3], none addressed who will finance, and how they will finance local pharmaceutical manufacture. In this section, I briefly discuss financial systems in sub-Saharan Africa in order to situate in the African context, Zimbabwe's financial systems (see section 2.6). The brief overview covers the financial architecture and key findings on financial systems and financing enterprises in Africa.

Allen *et al.,* (2011) give a comprehensive review of African financial systems. They acknowledge the huge economic and cultural diversity on the continent and different economic blocs and hence difficulties in generalising (ibid). Allen *et al.,* (2011) split the continent on geographical basis into; North Africa, West Africa, East Africa and Southern Africa. Using these geographical groupings, they discussed banking systems, the insurance sector, the stock markets, bond markets, the derivatives market, private equity, pension funds and other non-bank financial institutions and microfinance institutions (ibid). Beck *et al.,* (2009) also looked at finance in Africa focusing on the challenges, achievements, and the role of government in expanding financial sectors and the role played by foreign banks.

The picture that emerges of sub-Saharan African financial systems is that in most countries, the dominant financial institution is the commercial bank and secondly in many countries the major banks are foreign owned (Allen *et al.*, 2011, Beck and Hesse, 2009; Beck *et al.*, 2009, 2011, 2009). Foreign banks are thought to have brought more benefits than risks to countries of operation, however as I will argue in chapters 6 and 7, they have also driven the politics of lending that causes

[3] These strategies pertain to a phased approach to local production covering issues such as technology transfer, markets and economies of scale.

credit rationing. The nature of the foreign banks has changed over time from international subsidiaries of European banks to regional banks based on the African continent (Allen *et al.*, 2011, Beck and Hesse, 2009; Beck *et al.*, 2009, 2011, 2009). The major African regional banks are Ecobank (Ecobank website[4]), Standard Bank of South Africa trading as Stanbic outside South Africa (Standard Bank website[5]).

African banks charge high interests for debt finance, and have high interest spreads (Andrianova *et al.*, 2010; 2011a; 2011b; Beck and Hesse, 2009; Beck *et al.*, 2009, 2011; Demetriades and Gregory, 2011; Mugizi *et al.*, 2009; Nissanke, 2001). The banks characteristically have high liquidity and exhibit low lending ratios to avoid high loan defaults (Andrianova *et al.*, 2010; 2011a; 2011b; Mugizi *et al.*, 2009; Nissanke, 200). Moral hazard and adverse selection (see section 3.5.1) are reported to be high and are used to explain why African banks lend so little compared to other developing countries (Andrianova *et al.*, 2010, 2011a, 2011b; Aryeetey *et al.*, 1997; Nissanke, 2001). The general belief that high moral hazard frequency and adverse selection lead to low lending has been used by banks to argue that there are few fundable projects, whereas the entrepreneurs on the other hand argue that the banks do not know their businesses (asymmetric information barriers), are risk averse and would rather lend "safely" to government (Andrianova *et al.*, 2010, 2011a, 2011b; Aryeetey *et al.*, 1997; Nissanke, 2001).

Africa's financial systems are characterised by foreign ownership of financial institutions, commercial bank domination, and minimal financial development (Allen *et al*, 2011; Beck and Hesse, 2009; Beck et al., 2009, 2011). The low financial systems depth, breadth and efficiencies result in an inability to finance long-term projects from African savings as risk, liquidity, and maturity transformation activities are subdued (Beck and Hesse, 2009; Beck et al., 2009, 2011) (see also section 3.5.2 and chapters 6 and 8). The commercial bank dominated financial system exhibits low product and process innovation, as well as low domestic savings of a long-term nature hence

[4] http://www.ecobank.com/group/aboutus.aspx, accessed 12 April, 2012
[5] http://www.standardbank.com/Overview.aspx, Accessed 12 April, 2012

the inability to finance long term loans (Beck and Hesse, 2009; Beck et al., 2009, 2011). Given this background it is not surprising that enterprise financing is expensive and confined mainly to short term finance characterised by high interest rates and high interest rate spreads (Allen *et al.*, 2011; Andrianova *et al*, 2010, 2011a, 2011b; Beck and Hesse, 2009; Beck *et al.*, 2009, 2011; Fowowe, 2011; Nissanke, 2001).

For equity finance, African capital markets are not developed except for South Africa and to a lesser extent Nigeria (Beck and Hesse, 2009; Beck *et al.*, 2009, 2011). The capital markets therefore do not play a significant role in African financial systems and financing of enterprises. The major African developmental financial institutions are the African Development Bank (AfDB[6]) and the Development Bank of Southern African (DBSA[7]), whilst Afreximbank[8] is the key player in financing trade business on the continent. The African Finance Corporation (AFC[9]) a private corporation has emerged to finance long-term projects in Africa. The PTA bank[10] (Eastern and Southern African Trade and Development Bank) domiciled in Kenya is another pan African financial institution that has been active in medium to long term finance as well as financing trade business. The developmental financial institutions are characterised by ownership by governments and board positions held by Ministers of Finance or Central bank Governors. The regional development financial institutions' perception of the Africa risk appears somewhat different from foreign owned financial institutions, and domestic banks resulting in them financing enterprises where others have since stopped. Zimbabwe is a case in point (see chapters 6, 7 and 8).

The picture that emerges is that even though it is difficult to generalise for Africa as a whole, its financial systems are broadly underdeveloped, major financial institutions are foreign owned, and many financial systems are commercial bank dominated (Andrianova *et al*, 2010, 2011a, 2011b; Beck and Hesse, 2009; Beck *et al.*, 2009, 2011; Dailami and Walton, 1989; Fowowe, 2011;

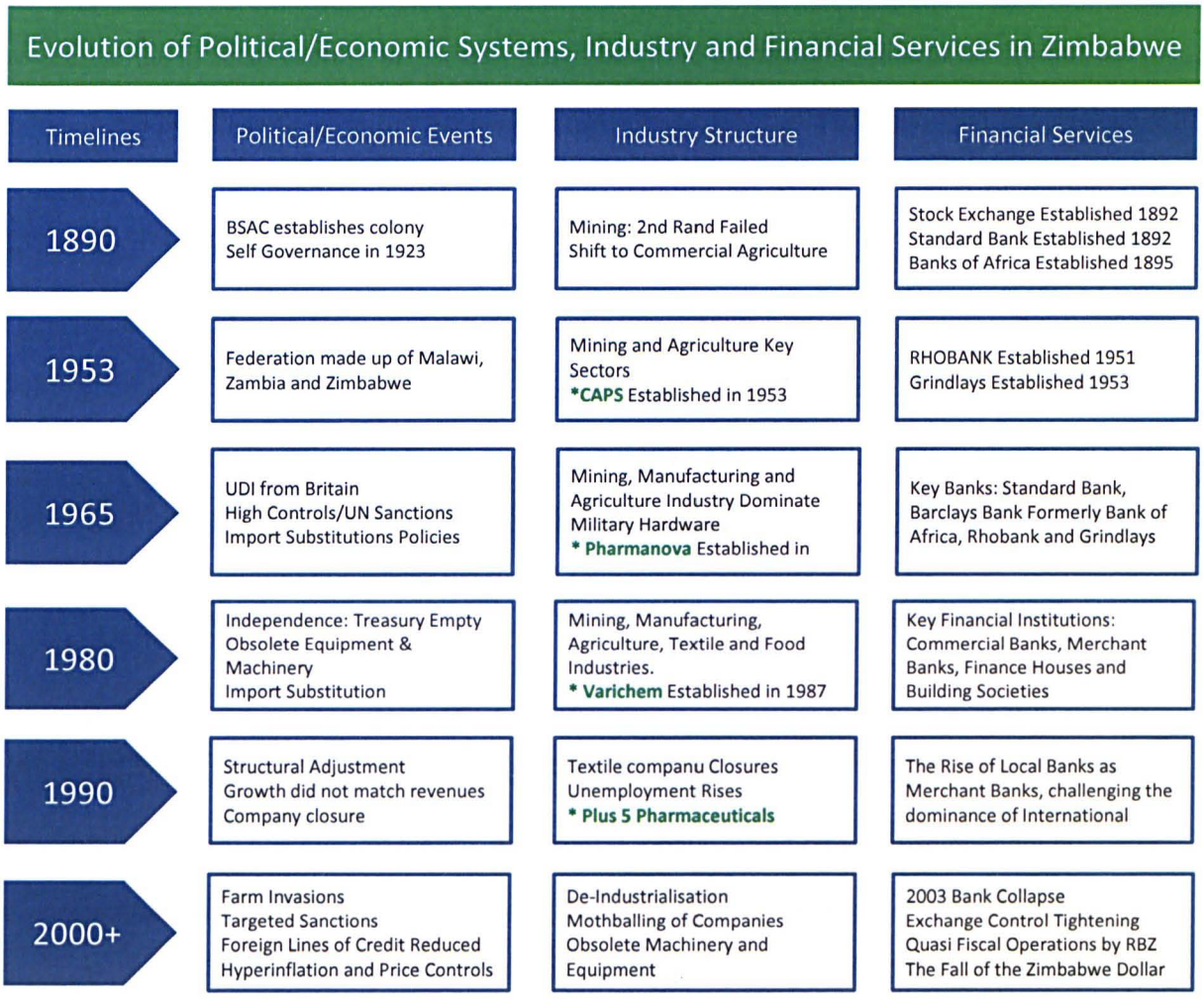
[6] http://www.afdb.org/en/about-us/, accessed 12 April, 2012
[7] http://www.dbsa.org/Pages/default.aspx, accessed 12 April, 2012
[8] http://afreximbank.com/afrexim/en/AboutUs.aspx, accessed 12 April, 2012
[9] http://www.africafc.org/?page_id=499, accessed 12 April, 2012
[10] http://www.ptabank.org/index.php?page=Mission-Vision, accessed 12 April, 2012

Fafchamps *et al.,* 1995; Nissanke, 2001). The banks charge high interest rates, have high interest spreads and operate mostly in the short-term financing spectrum (Andrianova *et al,* 2010, 2011a, 2011b; Nissanke, 2001). The most viable, stable, liquid and profitable financial institutions tend to be foreign owned (Allen *et al,* 2011). Equity finance is scarce because capital markets are underdeveloped except for South Africa and maybe Nigeria (Beck *et al.*, 2009). As a result capital markets do not play a key role in raising long-term finance critical for investment in plant, equipment and machinery critical for technological capability upgrading and fostering product and process innovation. Paradoxically, of all the literature surveyed on African financial systems, none addresses the expertise and skills involved in loan origination in African financing contexts; neither does the literature address lending technologies and innovation in African financial systems. The surveyed literature does not discuss the link between finance, especially long term finance and its relevance to technological capability upgrading and innovation from acquisition of the hardware aspect of technology (plant, equipment and machinery). The African banking and finance literature relies on moral hazard and adverse selection explanations for low lending by African banks, high interest rates and high interest spreads, neglecting the politics of lending (see chapters 6 and 8). As I argued in chapter 1, it is as simple as going to the bank and getting money but there are skills and technological capabilities at the pharmaceutical company and skills and lending technologies at the bank surrounding financing of enterprises. The surveyed literature on African financial systems and financing African enterprises neglects this key aspect of financing technological capability upgrading and innovation.

Now that I have given the context to African pharmaceutical manufacturing and African financial systems, I turn to Zimbabwe's political economy in the ensuing section.

2.4 Background to Zimbabwe's Political Economy

In this section, I discuss the political economy of Zimbabwe from a historic perspective. The year 1890, when the British South Africa Company arrived is the starting point. I discuss chronologically the key economic, political and historical events that influenced industrial development, financial systems and pharmaceutical manufacturing in Zimbabwe (Fig 2).



Source: Developed by Author from Karekwaivanani, 2003; Riddell, 1988; UN, 1980a, 1980b, 1980c; UNIDO 2011b; and various RBZ reports.

Figure 2: Political economy, and evolution of industry and financial services in Zimbabwe.

2.4.1 The early years to 1979

Zimbabwe is a Southern African landlocked country bordered by Mozambique to the east, Botswana to the west, Zambia to the north and South Africa to the south (Wild, 1992). Rhodesia the predecessor of Zimbabwe, traces its roots to 1890, when the British South Africa Company in 1889 obtained a Royal Charter with wide ranging powers over the territory to the north of the river Limpopo (ibid). The primary purpose was gold mining however, in 1923 the focus shifted from extraction of mineral resources to settlement and establishment of commercially viable agriculture in the colony, because mining had not been successful (ibid). The shift in focus to agriculture was the genesis of land inequities and inequalities, when the most fertile land was allocated to settlers and indigenous populations were forcefully displaced onto infertile lands (Wild, 1992; Helmsing, 1990). These land disputes sparked the liberation struggles and later on the land reform of the 2000s. From 1890 to about 1953, mining and agriculture were the mainstay of the economy and in parallel financial services evolved (see section 2.6) to support the enclave economy (Karekwaivanani, 2003; Riddell, 1988; Wild, 1992). The banking sector was dominated by four banks; Standard Bank, Grindlays, Rhobank and Barclays as shown in Fig 2 (UN, 1980a, 1980b, 1980c).

Faced with the prospects of involving the black community in the governance of the country, Rhodesia unilaterally declared independence (UDI) from Britain in 1965 and the period 1965-1979 was characterised by sanctions and import substitution industrialisation strategies accredited with the rapid development of industry in Zimbabwe (Riddell, 1988 and Kanyenze, 2006). Phimister (1988) posits that the Second World War and the close trade relations with South Africa spurred industrial development through import substitution. Importation of plant and machinery post UDI however slowed down due to sanctions and foreign currency restrictions (Bond, 1998; Phimister, 1988). Consequently, local industry was forced to utilise excess capacity originally invested for the federal market (Bond, 1998; Phimister, 1988). Since the country had depended on foreign direct investment and foreign loans for technology imports and industrial development the sanctions and

foreign currency shortages resulted in reduced capital investment and led to obsolescence of plant, equipment and machinery by 1979 (Bond, 1998; Phimister, 1988). At the same time, the economic attrition caused by the 14-year national war of liberation consumed huge economic resources (Bhebhe and Ranger, 1995).

2.4.2 The independence era

On attainment of independence in 1980, the economy had been weakened by 15 years of political unrest, the liberation war and comprehensive trade and social sanctions imposed by the United Nations (AfDB, 1998). As mentioned earlier industrial machinery had become obsolete due to run down and scarcity of foreign exchange (Bond, 1998; Phimister, 1988). At independence, the government maintained the UDI era economic controls and restrictions, and companies continued to experience foreign-exchange shortages (Chifamba, 2003). In response, the government partially eased foreign-exchange restrictions for meeting verified export orders first through an Export Revolving Fund (ERF) in 1983, and later through an Export Retention Scheme (ERS) in 1989, and later an Open General Import Licence (OGIL) in mid-1990 (ibid).

High growth from 1980 to 1982 was described as a once off event that utilised existing idle capacity and stockpile of stock that could not be sold during the sanctions era (Seidman, 1982; Stoneman, 1990). Seidman (1982) and Bond (1998), argue that the Zimbabwean growth model was the classical case of "growth without development" as a handful of commercial farms owned more than 50% of the national land area, and transnational mines contributed less than 2% of income tax. The manufacturing sector produced luxury and semi luxury goods for high-income earners, whilst over 75% of the population lived crowded on rocky or sandy, infertile and overgrazed soils (Seidman, 1982). Ndlela (2007) describes this phenomenon as a disarticulated economy resulting from grafted capitalism which characterises many former colonial economies. Ndlela (2007) argues that the economies are composed of the formal, informal and peasant sectors, with the bulk of economic activity occurring in the informal and peasant sectors. The formal sector

based in urban centres caters for 25% to 40% of the population and efforts to industrialise are encumbered by these hurdles because of this peculiar economic architecture (ibid).

The incoming government tried to narrow the inherited racial gap in living standards through budgetary transfers using education and health as the key elements of social transformation. As a result, education and health expenditure expanded through introduction of free health and education for all for the formerly disadvantaged population (Davies and Ratso, 2000). This high growth in education, health and public administration, constituted the areas Zimbabwe became renowned for in terms of development and social equity strides (Helmsing, 1990). Expansion of social services without a corresponding increase in revenue inflows however, led to budget deficits, forcing the government to abandon initial resistance to economic structural adjustment programmes (AfDB, 1998). On the advice of the International Monetary Fund (IMF) and technocrats in the Ministry of Finance, the country embarked on the economic structural adjustment programme in 1991, with disastrous consequences of de-industrialisation unemployment and deterioration of the health system (AfDB, 1997; Brett, 2005; Richardson, 2005).

2.4.3 The economic meltdown of the 2000s

After the economic structural adjustment programme and on the back of political instability, an unstable macroeconomic environment, and loss of confidence by investors in the long-term prospects of Zimbabwe, hyperinflation set in post 2000. This period saw Zimbabwe isolated internationally, scarcity of foreign currency became acute, FDI dwindled and emigration of skilled resources accelerated (AfDB, 1997; Brett, 2005). From 2003, bank closures and placement under curatorship by the central bank became prevalent (RBZ reports 2003 to 2008). Incidentally it was during these economic turbulent times that one company Varichem Pharmaceuticals (Pvt) Ltd started locally manufacturing ARVs in 2004 (see section 2.9) after being issued a compulsory license by the government. The economic situation continued to deteriorate culminating in hyperinflation that caused businesses to stop trading.

On 15 September 2008, the Global Political Agreement (GPA) was signed between the political parties Zimbabwe African National Union Patriotic Front (ZANU (PF)) and the two Movement For Democratic Change (MDC) factions; and this brought the three political parties into a coalition government and saw the beginning of some stability (STERP, 2009). Subsequently the Government of National Unity was formed, and the Minister of Finance in March 2009 launched the Short Term Emergency Recovery Programme (STERP): Getting Zimbabwe Moving Again (ibid). Amongst the various initiatives of resuscitating and rehabilitating the Zimbabwean economy, the strategy covered social protection which included; food and humanitarian assistance, and education and for health delivery the focus was on human resources, drugs, medical equipment and preventable diseases (ibid). The specific details on health delivery as stated in STERP 2009, included addressing drug shortages (average drug stocks in 2008 were 36% with prevalent stock outs of essential drugs, vaccines and medical supplies). The strategy also included capacitating Natpharm (national drug procurement agency) to supply all government health intuitions with drugs and pharmaceutical products. However, allocated funds for public health were inadequate and the health system depended on donor funding (see chapters 5 and 7). Lack of funding for the public health sector is a key issue, as it debilitated public health drug procurement as an industrial policy tool to support local manufacture (see chapter 5, 8 and 9).

In the short and medium term development plans, manufacturing was placed at the epi-entre of the stabilisation programme as policy makers targeted critical industry sub-sectors of food processing, beverages, textiles and ginning, clothing, footwear, fertiliser, pharmaceuticals, motor industries, packaging, paper printing and publishing, chemical and petroleum products and non-metallic products (STERP, 2009; MTDP, 2010). Initial estimates of financing industry resuscitation were pegged at USD 5 billion; however, it was acknowledged that funds were limited, (STERP, 2009; MTDP, 2010). The African Development Bank concurred that the private sector needed to be re-invigorated to kick start the economy (AfDB, 2009), and the main priority was providing a quick disbursing and self-liquidating line of credit in conjunction with South Africa, whilst Afreximbank provided support to the private sector through commercial banks. Only Afreximbank in

conjunction with The Ministry of Finance has availed USD 70 million for recapitalisation of industry through the ZETRAF fund which is likely to increase to USD 100 million with Afreximbank contributing USD70 million and the Ministry of Finance contributing USD 30 million (see chapter 6).

2.5 The Rise of Manufacturing in Zimbabwe

In this section, I discuss the rise of manufacturing in Zimbabwe and present a brief overview to give context to the pharmaceutical manufacturing discussion on in section 2.9 and chapter 5.

The Zimbabwean manufacturing sector was one of the most advanced and diversified in Africa (AfDB, 1994). Contributing 30% to GDP, and 35% of gross export earnings, manufacturing was the most important sector for the economy (ibid). Of critical value were the extensive linkages between manufacturing and key economic sectors such as mining and agriculture; an evolution linked to the political economy of Zimbabwe, as discussed earlier (Phimister, 1988). The manufacturing sector evolved to supply mining and agriculture leveraging an extensive infrastructure (AfDB, 1994; Mlambo 2000; Phimister, 1988, 2000; Stoneman, 1990). The biggest industrial sector was food processing followed by packaging (Ndlela, 2002). Other significant sectors included metals and metal products (17% industrial output) earning the most foreign currency for the country; chemical and petroleum products (16% industrial output); textiles and ginning (11% industrial output); and drink and tobacco (10% industrial output) (ibid). The manufacturing industry innovation legacy as mentioned earlier comes from the Second World War era and shortages that occurred, as well as the unilaterally declaration of independence (UDI) from Britain, trade with South Africa and sanctions (Pangeti *et al*, 2000; Phimister, 2000; Riddell, 1990). Prior to the Second World War (WWII), Zimbabwe was a destination of manufactures from Britain and South Africa. The onset of WWII however saw the blockade of trade routes and shortages of

manufactures which prompted the local economy to diversify and start local manufacturing (Pangeti *et al*, 2000; Phimister, 2000; Riddell, 1990).

The average annual industrial growth from 1944 to 1948 was 24.4%, as wartime interruptions to trade accelerated industrial development (Pangeti *et al*, 2000; Phimister, 2000; Riddell, 1990). After WWII, trade blockades were removed and imports from overseas started coming in, increasing competition. To counter this competition and to enable expansion of local markets and cater for overcapacity in the local industry the federation, comprising of Zambia, Malawi and Zimbabwe was set up in 1953 (Pangeti *et al*, 2000). However, most of the resources for development were channelled to Zimbabwe which spurred industrialisation in Zimbabwe with the enhanced market of the federation of Rhodesia and Nyasaland (Helmsing, 1990). During this era, foreign direct investment by South African and British companies flowed into Zimbabwe and contributed to set up of manufacturing industry (Phimister, 2000). Industrial policy moved from preference to protectionism in the period 1940 to 1965 (ibid). During this expansionary phase of manufacturing in Zimbabwe, three of the five major pharmaceutical companies were established; CAPS Pharmaceuticals in 1953, Datlabs in 1954 and Pharmanova the only one established much later in 1970 (UN, 1980a, 1980b, 1980c; UNIDO, 2007, 2011b). Phimister (2000) argues that the rise of manufacturing in Zimbabwe cannot be explained without considering trade agreements with South Africa, which were instrumental in industrial development.

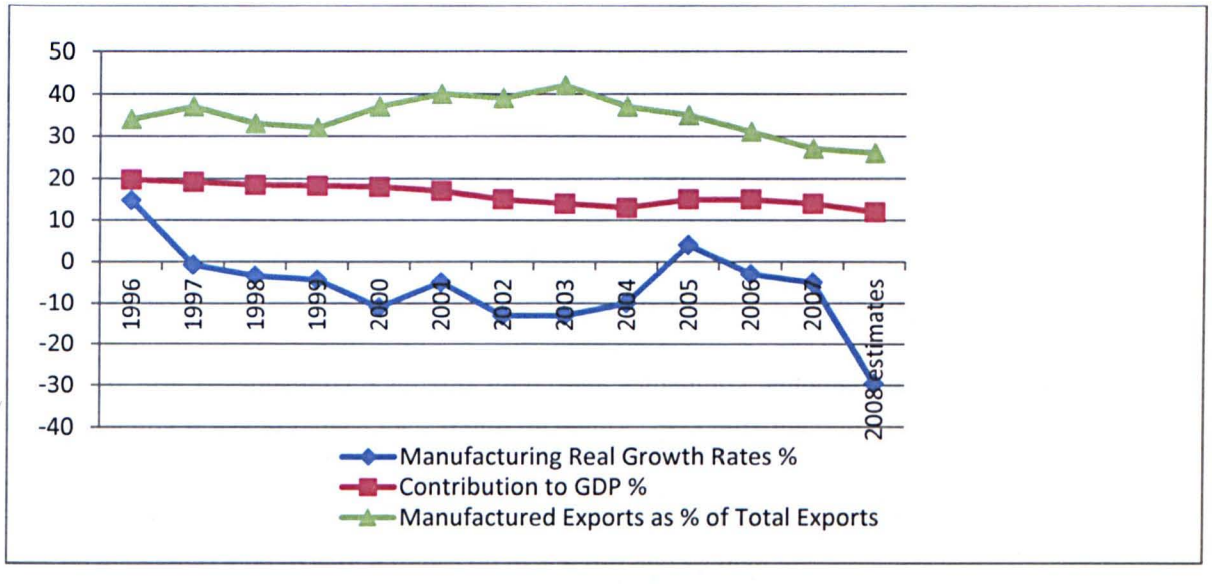
The Central African Federation and UDI were key events that shaped the evolution of the manufacturing sector in Zimbabwe (AfDB, 1994; Bond, 1993 and 2007; Phimister, 2000). During UDI, manufacturing contributed 25% of GDP and enforced protection acted as an accelerant to import substitution (Stoneman, 1990). However, the sector was geared to producing military hardware for the civil war, luxury and semi luxury goods for the high-income minority (ibid). The major centres of industrialisation were Harare (47%) and Bulawayo (22%) (Seidman, 1982). Ten years after declaring UDI, the economy flagged as plant and machinery became obsolete, and as a result, exports dropped, balance of payment worsened and the civil war placed an onerous burden

on the economy (Wild, 1992). The Rhodesian government introduced exchange and import controls, tariff controls and state involvement in industry with the sole purpose of making successful import substitution industrialisation (Seidman, 1982). Wages and taxes were kept very low ensuring high profits, and the stringent controls restricted outflow of capital to less than 5% of gross operating profits in 1975 (ibid). These controls remained in place until independence in 1980.

The first decade of independence (1980 -1990), was characterised by import substitution industrial policies, foreign exchange controls, limited import of machinery and a predominantly agro based economy (Phimister, 2000). The Government's formal role in industrialisation was enunciated in the Growth with Equity proposal in 1981 via the establishment of the Zimbabwe Development Corporation (Stoneman, 1990). Subsequent development strategies included the Transitional National Development Plan 1982/3-1984/5 and the First Five Year National Development Plan 1986-1990 (ibid). There was no explicit industrial policy in Zimbabwe and influences on industry were driven by other policies that covered macroeconomics and trade from 1980 up to 1998 (ibid). The Government came up with the Framework for Industrial Development, Trade and Investment in Zimbabwe which gave an outline of the intentions for industrial policy, and a white paper with the detailed industrial policy was presented later (UNDP/UNCTAD Country Assessment Report, 2000). From 1980 to 2000, limited sources of long-term finance and a general lack of foreign currency triggered a shift in industrial development policy towards export led growth strategies and export processing zones (Kanyenze, 2006).

Stoneman (1990) argues that state policy towards industry post-independence was conservative, and industrialisation policies were largely correct although inadequately theorised and pursued with insufficient priority as there was short run balance of payment constraints, which resulted in outcomes that could have been avoided. Stoneman (1990) further asserted that the industrialisation of Zimbabwe brought into the open the need for an intelligent state role in industrialisation as well as the fact that both import substitution and export orientation are necessary (ibid).

The decade plus commencing around 1997 to 2008 saw de-industrialisation as manufacturing declined at a grand scale caused by hyperinflation (Fig 3) (MTDP, 2010). As Fig 3, shows manufacturing real growth rates were negative from 1997 to 1998 except for 2005, signifying a gradual reduction in manufacturing capacity, loss of skills and technological capabilities. There was a declining contribution of manufacturing to GDP from a high of 20% in 1997 to 11% in 2008 (see Fig 3). Manufactured exports fell from 20% to slightly over 10%, although there was a period of increase from 2000 to 2003; however, this is a ratio where the GDP was shrinking annually. From 2008 onwards, the private sector declined to the extent of operating at 10% capacity, in an environment characterised by shortage of capital, foreign currency, and interrupted electricity supplies (ibid). Physical infrastructure crumbled, human capital emigrated and incentives and institutions were severely debilitated (AfDB, 2009).



Source: Zimbabwe's Medium Term Development Plan 2010

Figure 3: Manufacturing growths (percentage) for the period 1997 to 2008.

This picture of the state of manufacturing post 2000s helps put into context the state of manufacturing, and the economic challenges faced in locally manufacturing antiretroviral drugs since 2004. It also puts into perspective challenges faced in accessing long-term funds within and

outside Zimbabwe, in view of political, economic and macroeconomic instability. It is within this context that I approach financing of local ARV manufacture in Zimbabwe.

2.6 Zimbabwean Financial Architecture

In section 2.5 I built up a picture of the manufacturing sector for Zimbabwe, in this section, I turn to the financial systems context for the country.

Dailami and Walton (1989) reported that Zimbabwe had an unusually deep, British-influenced financial sector with a wide range of financial institutions. The financial institutions showed an elevated proportion of long-term assets and liabilities (ibid). The bond markets financed the public sector rather than the corporate sector (ibid). By 1994, after economic structural adjustment and financial liberalisation, Zimbabwe still had one of the most advanced financial systems in Africa, second only to South Africa (Carmody, 1998; Fafchamps *et al.*, 1995). The financial institutions consisted of commercial banks, merchant banks, finance houses, discount houses, building societies, the stock exchange, institutional investors, development financial institutions, venture capital companies, credit guarantee companies and credit reference companies (Carmody, 1998; Fafchamps *et al.*, 1995). Reflective of the African financial system discussed earlier (section 2.3), Zimbabwe's financial system is predominantly bank-based with a low-key capital market. The Zimbabwe Stock Exchange; established in 1893, was capitalised at US$ 3.4 billion as at December 2011, falling from US$ 4.1 billion the previous year[11].

The Zimbabwean bank financial architecture is composed of 18 commercial banks, 2 merchant banks, 4 building societies, 1 savings bank no finance houses and no discount houses, giving 25 bank-financial institutions (RBZ Monetary Policy, July 2012). The non-bank financial institutions include 16 asset management companies and 172 microfinance institutions numerous insurance

[11] http://www.financialgazette.co.zw/companies-a-markets/13921-zse-turnover-leaps-despite-poor-sentiment.html, accessed 25 August, 2012

companies and pension houses and the Deposit Protection Board set up in 2003 to administer the deposit protection fund (ibid).

The minimum capital requirements set by The Reserve Bank of Zimbabwe used to be US$ 12.5 million for Commercial Banks, US$ 10 million for Merchant Banks, US$ 10 million for building societies, US$ 7.5 million for Finance Houses and Discount Houses and US$ 2.5 million for Asset Management Companies (RBZ Monetary Policy, January, 2009). Table 1 shows the minimum capital requirement, and capitalisation levels for banking financial institutions in Zimbabwe as at 31 December 2011. These requirements have since been increased with new minimum capital requirements for commercial and merchant banks now USD 100 million, building societies USD 80 million, and finance and discount houses USD 60 million (RBZ Monetary Policy, July 2012). Microfinance institutions requirements rise to USD 5 million (see Table 2). The monetary authorities argue that this will bring stability to the banking sector (RBZ Monetary Policy, July 2012). Opponents however argue this will cause a collapse of local banks or cause the rise of a monopolistic banking structure. The increase in minimum capital requirements could be a push by policy makers for banks to lend more. In section 3.5.1 I discuss that financial institutions are the most highly leveraged form when one considers their equity and obligations to their depositors (their liabilities). Increasing the minimum capital requirements forces them to increase their equity and ultimately to lend more as they avoid having capital sitting idle. If they let the capital sit idle, by not lending it would reduce their return on equity. Secondly the opportunity cost for the bank to have USD 100 million sitting idle on their balance sheet would be untenable and the banks may thus be nudged to lend to earn a return on this additional capital.

In the next section, I discuss the evolution of Zimbabwe's financial architecture.

Table 1: Banks declared capital and prescribed capital as at December 2011.

Type of Financial Institution	Institution	Declared Core Capital As at 31 December 2011	Prescribed Minimum Capital
Commercial Banks	CBZ Bank	US$ 65.2 million	**US$ 12.5 million**
	Standard Chartered	US$ 53.2 million	
	Barclays Bank	US$ 33.4 million	
	BancABC	US$ 32.1 million	
	Stanbic Bank	US$ 32.0 million	
	ZB Bank	US$ 20.7 million	
	NMB Bank	US$ 19.8 million	
	MBCA Bank	US$ 19.5 million	
	Metropolitan Bank	US$ 18.0 million	
	FBC Bank	US$ 16.8 million	
	Interfin Bank	US$ 16.3 million	
	Agribank	US$ 14.1 million	
	TN Bank	US$ 13.4 million	
	Trust Bank	US$ 12.8 million	
	Kingdom Bank	US$ 4.2 million	
	Royal Bank	US$ 43.4 million	
	ZABG Bank	US$ -15.3 million	
Merchant Banks	Tetrad Investment	US$ 12.7 million	**USD$ 10 million**
	Ecobank	US$ 10.9 million	
	Genesis Investment	US$ -3.2 million	
	Renaissance	Under Curatorship	
Building Societies	CBZ Building Society	US$ 22.7 million	**US$ 10 million**
	CABS	US$ 14.4 million	
	FBC Building Society	US$ 13.5 million	
	ZB Building Society	US$ 13.4 million	
Savings Bank	POSB	US$ 10.8 million	

Source: RBZ Monetary Policy Statement, January 2012

Table 2: The new minimum capital requirements for financial institutions in Zimbabwe.

Financial Institution	Current Minimum Capital: USD Million	New Minimum Capital Required: USD Million
Commercial Banks	12.5	100
Merchant Banks	10	100
Building Societies	10	80
Finance Houses	7.5	60
Discount Houses	7.5	60
Microfinance Institutions	1	5

Source: RBZ Monetary Policy Statement, July 2012.

2.6.1 Evolution of the financial architecture

Zimbabwean financial institutions have been around for almost 120 years and one can argue that they should have developed to such an extent that their lending technologies and institutional architecture could facilitate industrial development financing that fosters technological capability upgrading and innovation take-off for Zimbabwean enterprises. In the ensuing sections I discuss the emergence of the financial architecture in Zimbabwe.

The Stock Exchange was set up in the early 1890s (Karekwavainani, 2003), and the first bank Standard Chartered, then The Standard Bank of South Africa, was set up in 1892 (UN, 1980a, 1980b, 1980c). In 1895, Barclays Bank International Limited (wholly owned UK subsidiary) which later became Barclays Zimbabwe Limited was the second bank to be set up (UN, 1980a, 1980b, 1980c). The third bank to be set up was Rhodesia Banking Corporation (RHOBANK) in 1951 (ibid). It later became Zimbank and then ZB Bank (UN, 1980a, 1980b, 1980c). Shareholders for RHOBANK were Nedbank of South Africa (70%), and 30% minorities following public issue of shares in 1967 (UN, 1980a, 1980b, 1980c). The fourth bank, a wholly owned UK subsidiary was Grindlays Bank International set up in 1953 (UN, 1980a, 1980b, 1980c). Grindlays later sold its African businesses in eight African countries to Standard Bank of South Africa, which operate outside South Africa as Stanbic Bank Limited (Stanbic Zimbabwe website, 2012[12]). These were the dominant banks in Zimbabwe up to 1980 including BCCZ, and afterwards continued to dominate deposits and loans market (see Tables 3, 4 and 5) (UN, 1980a, 1980b, 1980c).

Commercial banks had sister companies in merchant banking (see Table 5). Standard Chartered had Standard Merchant Bank, ZB Bank had Syfrets Merchant Bank and Barclays Bank had Barclays Merchant Bank (UN, 1980a, 1980b, 1980c). Merchant Bank of Central Africa (MBCA) owned by Phillip Hill Acceptances Corporation of South Africa, N.M. Rothschild of London and Rhodesia Selection Trust among others, later became a commercial bank (UN, 1980a, 1980b,

[12] http://www.standardbank.com/Overview.aspx, accessed 12 April, 2012.

1980c). The financial architecture morphed over time to a commercial bank dominated financial system, with a low-key footprint and influence of merchant banks, finance houses and discount houses. Lending technologies used by merchant banks, and other financial institutions, such as leasing or asset backed lending technologies, equipment based lending technologies and fixed asset lending technologies were de-emphasised due to the changes in the financial architecture instigated by the Economic Structural Adjustment Programme of 1991 (Group Chief Executive, Domestic Bank F, 2011). I will discuss the lending technologies in section 2.6.3.

By 1991, the financial architecture was composed of 4 commercial banks; 2 discount houses; 3 merchant banks; 3 building societies; 3 finance companies; 1 post office savings bank, the Zimbabwe Stock Exchange, 3 development financial institutions, 2 brokerage houses, and a large number of insurance and pension companies (AfDB, 1997). After financial liberalisation in 1991, there were huge increases in interest rates and devaluation of the Zimbabwe dollar, which negatively affected capital investment for the local manufacturing industry, as companies put off capital investment (Sachikonye, 1999). Four years later in 1995, 2 national discount houses entered the sector. Bureaux de Changes had been introduced in 1994, leading to an increase in the range of financial services offered in the country (AfDB, 1997). Historically commercial banks mobilised more domestic resources; averaging about 46% for each of the years 1987 to 1990, whereas merchant banks mobilised around 6% for the same period. Building societies mobilised about 7% and the Post Office Savings Bank, used mostly to fund government projects, mobilised about 20% for the same period (ibid). This reinforces the earlier argument that African financial systems are dominated by commercial banks.

In the next section I turn to the dominance of commercial banks in Zimbabwe's financial system.

Table 3: ***Zimbabwe's banking financial institutions architecture in 1979.***

Commercial Banks					
Name of Institution	Year Established	Ownership	Head Offices	Anecdotes	
Standard Bank of South Africa	1892	Foreign: Initially RSA, then UK. Wholly owned subsidiary.	Abroad with local operations forming small part of total world business in terms of branch network and liabilities. Standard Bank was the most committed to Rhodesia!!.	Was established at the personal request of C.J. Rhodes. The name of the bank later changed to Standard Bank Limited in 1962.	**Duo-polistic dominance of the banking sector:** In 1963, these two banks accounted for 90% of deposit liabilities of the five banks in the federal zone, and advanced 85% of funds in the form of loans and bills of exchange.
Barclays Bank International Limited	1895	Foreign: UK: Wholly owned subsidiary	Abroad with local operations forming small part of total world business in terms of branch network and liabilities	Roots in Bank of Africa's operations and those of The National Bank of South Africa (which commenced operation in 1911). They were both absorbed by Barclays D.C.O. in 1926.	
Grindlays Bank International	1953	Foreign: UK: Wholly owned subsidiary	Abroad with local operations forming small part of total world business in terms of branch network and liabilities	Formely National and Grindlays Bank Limited, being followed by Ottoman Bank which it absorbed in 1969 as a general takeover of branches of Ottoman Bank in Africa and The Middle East.	
Rodhesia Banking Corporation (RHOBANK)	1951	Nedbank 70% (RSA): 30% of shareholding in the hands of a minority following public issue in 1967.	Abroad with local operations forming small part of total world business in terms of branch network and liabilities	Began in Rhodesia as The Netherlands Bank of South Africa Limited. The name only changed in 1972. The only bank listed on The RSE.	

Source: UN, 1980a, 1980b, 1980c

Table 4: Zimbabwe's banking financial institutions architecture as of July 2012.

	Type Of financial Institution	Year Of Establishment	Headquarters Country	Reporting Structure	Deposits	Loans And Advances	Profit After Tax
Regional and International Banks	Commercial Banks				$ Millions as at December 2010		
	Barclays Bank of Zimbabwe Ltd	1912	UK	Geographic and Functional	183	43	-1
	Banc ABC: The heritage dates back to 1956.	1956	Botswana	Geographic and Functional	217	104	3.4
	MBCA Bank Ltd: Established as Merchant Bank of Central Africa. Converted Licence to Commercial Bank in 2004.	1956	South Africa	Geographic and Functional	135	82	1.6
	Stanbic Bank Zimbabwe Ltd: Standard Bank Group South Africa in 1992 bought Grindlays Bank established in 1953	1992	South Africa	Geographic and Functional	302	97	8
	Standard Chartered Bank Zimbabwe Ltd	1892	UK	Geographic and Functional	223	109	8
Local Banks	**Agribank**: History can be traced to 1924 with establishment of the Land and Agriculture Bank. AFC (Agriculture Finance Corporation) established in 1971 through amalgamation of Land and Agricultural Bank and the Agricultural Assistance Board. The Bank wa	1924	Zimbabwe	Geographic			
	CBZ Bank: Formerly BCCZ established in 1980. Became CBZ in 1991 after the Government took total shareholding and saved it from collapse.	1980	Zimbabwe	Geographic	578	425	21
	FBC Bank	1997	Zimbabwe	Geographic	135	76	3.7
	Interfin		Zimbabwe	Geographic			
	Kingdom Bank: Established as an Accepting House in 1997	1997	Zimbabwe	Geographic	53	78	4
	Metropolitan Bank Of Zimbabwe	1999	Zimbabwe	Geographic	44	32	2
	NMB Bank Ltd	1992	Zimbabwe	Geographic	66	60	0.7
	Royal Bank		Zimbabwe	Geographic			
	TN Bank		Zimbabwe	Geographic	33	30	1.1
	Trust banking Corporation		Zimbabwe	Geographic			
	Zimbabwe Allied Banking Group Limited		Zimbabwe	Geographic	111	70	1.4
	ZB Bank	1951	Zimbabwe	Geographic			
	Merchant Banks						
	Genesis Investment Bank Ltd		Zimbabwe	Geographic			
	Ecobank Zimbabwe Ltd		Nigeria	Geographic	41	27	-6
	Renaissance Merchant Bank Ltd	2001	Zimbabwe	Geographic	0.01	0.01	0.004
	Tetrad Investment Bank	1995	Zimbabwe	Geographic			
	BuildingSocieties						
	CBZ Building Society: Formerly Beverley Building Society		Zimbabwe	Geographic			
	FBC Building Society:	1992	Zimbabwe	Geographic			
	ZB Building Society: Formerly Founders and then Intermarket Building Society	1961	Zimbabwe	Geographic			
	CABS Building Society		South Africa/UK	Geographic			

Source: RBZ monetary policy statement, July 2012.

Table 5: Zimbabwe's financial institutions financing industry prior to 1980.

Accepting Houses and Merchant Banks				
Name of Institution	Year Established	Ownership	Product Lines	Notes
Merchant Bank Of Central Africa (MBCA)	1956	Phillip Hill Acceptance Corporation (SA) and N.M. Rotschild of London and Rhodesia Selection Trust and others.	Bills of Exchange, Hire Purchase Financing, Medium Term Loan Finance, Foreign Market Transactions, Equity Issues, Stock Exchange Transactions, Portfolio Management, Company Broking and Corporate Reconstruction.	Closely geared to corporate needs (wholesale banking) and large account holders. Played a critical role in the size and composition of the private sector's medium term investment in the development process.
Rhodesian Acceptances Limited (RAL)	1956	Closely tied to Anglo American Corporation, although promoted by Lazard Bros. It had ties to Barclays by direct implication. Anglo American Corporation was main shareholder.		
Syfrets Merchant Bank	1971	Rhobank as at 1979: Commenced business as Nefricho Acceptances Ltd, but later merged and became part of Rhobank.		
Standard Merchant Bank	1971	Standard Bank Group: Originally Accepting Bank of Rhodesia (Portuguese-owned company), but later fell into Standard Bank group.		
Discount Houses				
British and Rhodesian Discount House (BARD)	1959	Gillet Bros (20%) and the balance was held by various Insurance Companies.	Attracted deposits on a call basis, and funds were used to purchase a portfolio of securities in State/Municipal stock, Treasury Bills, Acceptances, Agricultural Marketing Authority (AMA) Bills, and Negotiable Certificate of Deposits (NCD). Portfolio hol	
Discount Company of Rhodesia	1959	Private Company with greatest shareholding (30%) held by AAC. Shareholders later became Barclays Bank, Grindlays Bank, Standard Bank, Rhobank, AAC and SA based Insurance Companies (as at 1979).		

Source: UN, 1980a, 1980b, 1980c

2.6.2 Dominance of commercial banks

The commercial bank dominated financial system was further reinforced after financial liberalisation in 1991 (see Table 4), with a gradual reduction in the role played by merchant banks, finance houses and discount houses compared to three decades earlier (see Table 5). Players in the industry blame the changes in the financial architecture on the IMF and World Bank instigated Economic Structural Adjustment Programme of 1991 (see chapter 6 and 7). As cost of funds on the interbank market increased due to interest rate increases after financial liberalisation, there was a stampede to convert merchant banking licenses and other banking institution licenses to commercial banking licenses to access cheap deposits (current and savings accounts) and reduce cost of funds (Group Chief Executive, Local Bank F, 2011). This move played a significant role in shrinking a critical financial space for industrial development as specialised financial institutions were replaced by commercial banks with a concomitant loss of skills and knowledge (know-how, know-whom and know-why) as certain lending technologies were either lost or de-emphasised. Experienced managers left merchant banks or were de-skilled as they converted into commercial banks specialising in financing trade and commerce only.

After liberalisation in 1991, local commercial banks came on the scene with the establishment of FBC Bank in 1997 as a commercial bank and other financial institutions such as Kingdom Bank which began life as a Discount House, whilst NMB and Trust Bank began as Merchant Banks (Group Chief Executive, Local Bank F, 2011). At the same time, international banks collapsed their merchant banking units into corporate banking division or units. Standard Chartered Merchant Bank was incorporated into the corporate banking division[13]. Barclays Bank Zimbabwe still has Barclays Merchant Bank Limited (100% ownership) and Fincor Finance Corporation Limited (100% ownership) on its books, although they are now dormant companies (Barclays Financial Statements for Half year ended 30 June 2011[14]). As mentioned earlier, conversion of merchant banks into commercial banks was driven by the need to access cheap current and savings

[13] Practice knowledge of the researcher of having worked in the industry for 7 years.
[14] http://www.barclays.com/africa/pdfs/2011_half_year_results.pdf, accessed 10 October, 2011

accounts resources. It precipitated generalisation of specialist skills geared to function in the medium term to long-term loan finance for industrial financing. Focus shifted more to financing trade and commerce by commercial banks (see chapter 6 and 8). This development resulted in loss of these specialist skills for the country as merchant bankers emigrated or left banking. With the loss of the "old timers" (see section 3.6), there was inherent loss of institutional memory and tacit knowledge, critical for knowing and learning; the know-why, know-who, know-what aspects of learning and knowledge (Lave and Wenger, 1991; Ernst and Lundvall, 1997; Polanyi, 1966). This complexity is ignored in contemporary discourses on financing local pharmaceutical manufacturing in Africa. Commercial banks in Zimbabwe specialise in short-term lending on the back of short-term hot deposits.

In the next section I discuss the lending technologies in Zimbabwe, which were affected by the demise of the merchant banks and the dominance of commercial banks.

2.6.3 Prevalent lending technologies in Zimbabwe

Berger and Udell (2006) defined lending technology as "a unique combination of primary information source, screening and underwriting policies/procedures, loan contract structure, and monitoring strategies/mechanisms". Paraphrasing; lending technologies are tools that financial institutions use to gather and screen information about a borrower to assess risks, the venture's viability, profitability and ensuring likelihood of the borrower repaying debt (see section 3.5.2). Lending technologies therefore operationalise products used to finance an enterprise and covers issues such as title of an asset financed by the bank (ibid). Table 6 shows lending technologies prevalent in Zimbabwe in 1980, 2000 and 2010. The trend shows a gradual reduction in key lending technologies critical for financing industrial development; leasing/asset based lending, equipment based lending, and motor vehicle and fixed asset lending as the country went through different economic phases as discussed in section 2.4. Financial statement lending is the dominant

lending technology used in Zimbabwe. The relationship management model is used to augment the financial statement lending approach (Berger and Black, 2011; Berger *et al.*, 2008; Berger and Udell, 2006).

Table 6: Lending technologies in use in financial institutions in 1980, 2000 and post 2010.

Type of Lending Technology		Type Of Financial Institution Involved	Lending Technology Activity in Zimbabwe		
Transactional Based Technology or Hard Information Technology			1980	2000	2010
Financial Statement Lending		Commercial Banks, Merchant Banks, Finance Houses	Active	Active	Active
Leasing/Asset Based Lending		Leasing Companies, Finance Houses, Commercial Banks	Active	Limited Activity	Very Limited Activity
Equipment Based		Finance Houses, Merchant Banks	Active	Limited Activity	Very Limited Activity
Small Business Credit Scoring		Commercial Banks, Merchant Banks, Finance Houses	Active	Active	Active
Fixed Asset Based Lending	Commercial Real Estate	Building Societies	Active	Limited Activity	Very Limited Activity
	Residential Real Estate	Building Societies	Active	Limited Activity	Very Limited Activity
	Motor Vehicle	Leasing Companies, Finance Houses	Active	Limited Activity	Very Limited Activity
Relationship Lending Technologies or Soft Information Technology					
Relationship Lending		Commercial Banks	Active	Active	Active

Source: Developed by author from Berger *et al.*, 2008; Berger and Udell, 2006; Bartoli *et al.*, 2010; Hirofumi *et al.*, 2006, Fieldwork, 2011 and practice.

The mechanics of lending technologies are some of the complexities surrounding financing of local pharmaceutical manufacture that have been ignored in contemporary discourses (see chapters 3, 5 and 6).

2.7 Financing Zimbabwean Enterprises and Industrial Development

In this section I discuss how enterprises and industrial development in Zimbabwe were financed, bringing out the importance of transnational corporates and foreign direct investment in the set up and expansion of industry (Bond, 1993, 2007; Stoneman, 1978). Reliance on FDI implies that

banks did not play a key role in industrial set up (ibid). They may thus lack institutional memory, tacit knowledge and expertise key to finance technological capability upgrading. However, there is evidence that merchant banks were active in the local currency long term finance market and competed with development financial institutions (AfDB, 1998).

As mentioned earlier, Zimbabwe's manufacturing sector set up was financed by FDI as subsidiaries of British and South African companies established operations in the country (Bond, 1993, 2007; Stoneman, 1978). Foreign capital; FDI and loans, were thus instrumental in the evolution of the manufacturing sector (Phimister, 1988; Riddell, 1990). The economy attracted such high amounts of foreign capital to the extent that in 1965 even though the South African economy was ten times bigger, the stock for Zimbabwe was one third that of South Africa (Stoneman, 1978). What is key as will be discussed in chapter 6 is the importance of FDI and foreign loans (foreign currency) for acquisition of plant, equipment and machinery (Dailami and Walton, 1989).

During the sanctions era when exchange controls imposed, capital was locked up in Zimbabwe due to non-repatriation of profits or dividends to offshore shareholders (Bond, 1993, 2007; Stoneman, 1978). The blocked funds, made up of un-remitted profits and dividends were re-invested into local businesses, leading to the overcapacity pointed out by Bond (1993, 2000). International isolation due to sanctions, and the shortages of foreign currency slowed down replacement of machinery and equipment leading to obsolescence of industrial machinery (ibid). At independence, international companies shied away from capital investment, whilst they capitalised on relaxed foreign exchange regulations to remit locked up profits and dividends until the Finance Minister stopped the tide in 1984 (Burdette and Davies, 1987). Thus, instead of recapitalisation when exchange controls were relaxed, there was capital flight, and the industry remained with obsolescent equipment save for a few companies borrowed offshore or leveraged foreign ownership to import plant and equipment (Jenkins, 1998; Pangeti *et al.*, 2000).

Domestic savings were not a constraint to lending as there was excess liquidity in the banking sector (Jenkins, 1998). Jenkins argued that in the period 1969 – 1974, savings were more than sufficient to finance high demands for the expansion and improvement of capital stock (ibid). Reflecting slowdown in capital investment, between 1980 and 1989, fixed investment declined from 25% to 16% of GDP, inadequate for maintaining even current capital stock (AfDB, 1998). Dailami and Walton (1989) also reinforced the assertion that business fixed investment was low after independence especially amongst the mostly foreign owned large companies, which had been traditionally the sources of capital for industrial development. Foreign owned companies were reluctant to take a long-term perspective and invest in the country, as they were uncertain of government's policies on remittance of profits and dividends locked up in the country (Burdette and Davies, 1987). Another reason for low capital investment was foreign currency shortages, which deterred them from importing capital goods in addition to excessive administrative interventions. Some of the administrative hurdles included foreign currency certificates, import controls, and price controls (ibid). Other factors cited for lack of investment were socio-political issues (Stoneman, 1978; Bond, 1993; Chigumira and Masiyandima, 2003).

Zimbabwe recognised that it needed to modernise and retool industry (AfDB, 1994). Consequently, the African Development Bank (AfDB) channelled long-term finance (foreign currency loans) through the Zimbabwe Development Bank (ZDB) (ibid). Two of the 32 long-term loans went to pharmaceutical companies for replacement of equipment (ibid). CAPS Pharmaceuticals used the loan to modernise its tablet and capsule machinery and Pfizer to improve quality control (ibid). The AfDB (1994) reported the vibrancy of the merchant and commercial banks in Zimbabwe post financial liberalisation, explaining that ZDB faced stiff competition in its preserve of term lending especially from merchant banks. This indicates an active role by merchant banks in the long-term financing arena, and as I will argue in chapter 6, their demise led to loss of this local capability in long-term finance.

The AfDB strategy, an institutional arrangement innovation, was a shift from traditional FDI and foreign loans to capitalise industry,. What is relevant to this study is the fact that funds for industrial recapitalisation came from outside Zimbabwe (AfDB sourced funds), reinforcing Jenkins's (1998) and Dailami and Walton's (1989) argument that what was critical for industrial finance was foreign currency and not domestic savings. Banks are key to financing industrial development as they are not only involved in intermediating domestic savings but can structure foreign currency loans for industry with their correspondent foreign banks or their parent offshore, an activity highly linked to macroeconomic policy, fiscal policy and political stability and predictability (see chapters 8 and 9).

In spite of the sophistication of the Zimbabwean financial system, the depth of domestic savings, pension and insurance funds showing a remarkable potential to finance long-term loans; the financial system was more inclined to financing the public sector than the private sector (Dailami and Walton, 1989). Savings from commercial banks, post office savings bank as well as pension and insurance funds were used to finance the public sector as short-term loans with automatic rollovers (ibid). The long-term domestic savings went into Agricultural Marketing Authority (AMA) bonds and bills utilising mandatory prescribed asset ratios (ibid). This reflected the agro-based nature of the economy and the tendency of government policy to support agriculture (ibid). Paradoxically there was little evidence of public sector debt crowding out the private sector, as the private sector preferred to use internal funds for financing (Dailami and Walton, 1989; Fafchamps *et al*, 1995). The demand for credit from the private sector was thus subdued; an insight reinforced by Bond (1993; 2007), who argued on overcapacity and over accumulation in the industrial sector. In as much as this argument is solid for local currency long-term loans, it is flawed when considering financing importation of technology for technological capability upgrading. The local manufacturing industry does not produce capital equipment. Accessing a local currency long-term loan without access to foreign currency as was the case in Zimbabwe where shortages of foreign currency were rampant means the company could not import capital equipment. Zimbabwe may have had high domestic savings, but local savings could only work if local fabricators and

toolmakers could manufacture the required capital equipment. Thus, because all plant, machine and equipment are imported, the local companies depend entirely on foreign currency to import capital goods.

2.8 The Zimbabwean Pharmaceutical Manufacturing Landscape

In this section, I discuss pharmaceutical manufacturing in Zimbabwe. The intention is to give context to the sector's architecture and its capabilities, and finally the story of antiretroviral (ARV) drug manufacture in Zimbabwe in section 2.9.

There are nine pharmaceutical manufacturing companies registered with the Medicines Control Authority of Zimbabwe (MCAZ), and of these, five are the major generic manufacturers accounting for 90% of the formulation businesses (Table 7) (UNIDO, 2011b). Using Seiter's (2005) classification, Zimbabwean pharmaceutical companies fall into generics companies with predominantly national operations and small-scale local manufacturers limited to formulation and packaging activities. Subsidiaries of large multinational companies and generics manufacturers operating globally do not currently operate manufacturing plants in Zimbabwe (UNIDO, 2007, 2011b). The companies operate in a competition intensive, low margin commodity-type business, where profitability and long-term viability depend on economies of scale, assured demand and large markets (Berger *et al.*, 2009; Kaplan and Laing, 2005). Although the pharmaceutical industry dates back to 1953, little vertical integration has occurred and no drug discovery or production of APIs takes place (UNIDO, 2007, 2011b), pointing to lack of or a slow rate of technological capability upgrading and innovation. The pioneer company, CAPS Pharmaceuticals then Central African Pharmaceuticals (Private) Limited, was founded in 1952 operating in the formulation and wholesaling business (CAPS website, 2012; UNIDO, 2007, 2011b). In 1958, CAPS stopped general wholesaling and focused on manufacturing and marketing of pharmaceuticals (CAPS website, 2012).

	Caps Pharmaceuticals	Datlabs	Pharmanova	Plus 5	Varichem
Year Established	1952	1954	1970	1996	1985
Ownership	Public Company, but delisted in 2012, and now privately held company.	Subsidiary of Adcock Ingram, (RSA) and Tiger Brands	51% Zimbabwean, 49% European Owners	100% Zimbabwean	100% Zimbabwean Company
Number of Employees	200	175	Not known	91	110
Facility Manufacturing Licensing	MCAZ (Zimbabwe), MCC (South Africa), NMRC (Namibia), DRU (Botswana)	MCAZ (Zimbabwe), NMRC (Namibia)	Not known	MCAZ (Zimbabwe)	MCAZ (Zimbabwe), MCC (South Africa), NMRC (Namibia), DRU (Botswana)
Last GMP Inspection	MCAZ, 2010	2007	Not known	2009	2009
Product Range	204 (as at end 2007), with over 200 products registered in 16 sub-Saharan countries.	137 (as at end 2007)	Not known	28	103 (as at end 2007)
Capacity Utilisation	20-30% (2009)	32% (2009)	Not known	17.5% (Plant shutdown for upgrades)	30-60%
Facility Design and Layout	Recently refurbished but requires HVAC (heating, ventilation, air conditioning)	Requires upgrade. Requires HVAC (heating, ventilation, air conditioning)	Not known	Requires upgrade. Requires HVAC (heating, ventilation, air conditioning)	GMP Compliant, recently refurbhised. HVAC operational
Average Age of Equipment	Not known	16.5+yrs (Range 1-30 yrs)	Not known	8.25 yrs (Range 0.5-20 yrs)	9.6 yrs (Range 2-30 years)
Additional equipment needed	Not known	24	Not known	30	18
Capital needed for additional equipment	Not known	US$ 1.5 million	Not known	US$ 1.5 million	US$ 1.0 million
Research and Development	Reformulations, seeking expansion of products through products gone off patent as well as technology transfer in collaboration with Indian manufacturers of ARVs	R&D done in South Africa. Only undertakes reformulation, ARV bioequivalence studies done in South Africa.	No formal R&D Department, but were reviewing its establishment.	Functional R&D Department: Formulation R&D. Collaboration with external research organisation (Contract Research Organisations in India or RSA) on bio - equivalence and studies for ARVs	Functional R&D Department: Formulation R&D, Operational Research, Clinical Research Trials, Herbal Medicine. Collaborating with School of Pharmacy in analysis of raw materials. Working with CROs in India and QC labs in South Africa.
ARV Portfolio	Nevirapine, Lamuvidine	None Manufactured	None Manufactured	None Manufactured	See Table 10 for an extensive list of ARVs manufactured
Markets: All Products	Local market: Exports to South Africa, Zambia, Malawi, Botswana, Mozambique, Tanzania, Uganda, Namibia, and Mauritius	Wholesalers 79%, Pharmacies 15%, Public Sector 5% and NGOs <1%. **Exports**: Zambia, Botswana, Malawi, Kenya, Tanzania, Rwanda & Burundi. Potential: Uganda, Angola, RSA,	Wholesalers = 95%, Pharmacies, Public Sector % NGOs = 5%. Used to export to South Africa, Botswana, Malawi, Zambia and Namibia.	Wholesalers = 80%, Public Health = 10%, Pharmacies = 8%, NGOs = 2%. In the past exported to Malawi, Swaziland and The West Indies.	Wholesalers>Public Health>Retail Pharmacies and NGOs. In the past exported to South Africa, Botswana, Namibia, Angola, Mozambique, Swaziland, Lesotho, Yemen, Malawi

Source: UNIDO, 2007, 2011b

Datlabs (Pvt) Ltd was established in 1954 as a subsidiary of Ingrams, a South African company and Pharmanova (Pvt) Ltd was established in 1970 (UNIDO, 2007, 2011b). Zimbabwean entrepreneurs established Varichem Pharmaceuticals (Pvt) Ltd in 1985 (ibid). An interesting case involves Plus 5 Pharmaceuticals, which was established in 1996 using venture capital funding (UNIDO, 2007, 2011b). Plus 5 Pharmaceuticals presents an interesting take on Zimbabwe's financial system capability because venture capital was used to establish a successful pharmaceutical company at a time the country was just emerging from the economic structural adjustment programme. The directors eventually bought out the venture capitalists (UNIDO, 2011b). Another insight gleaned from the venture capital deal is reinforcement of earlier discussions about the early development, sophistication, and depth of Zimbabwe's financial systems. This development of financial systems was however not sustained because of the economic challenges the country faced in the last decade.

Historically, the target market for Zimbabwean manufactured pharmaceuticals was the larger Central African Federation consisting of Malawi, Zambia, and Zimbabwe (Marketing Director, 2011). The industry used to supply 122 products out of the 260 essential drugs; 46% of the country's essential drugs (UNIDO, 2011b and NECF, 2011). When new product development initiatives underway are factored in, local drug provision can rise to 75% of essential drugs and contribute 5% to GDP (NECF, 2011). Zimbabwe was historically less dependent on imported drugs (Turshen, 2001). Government policy supported local manufacturing capability by purchasing as much as 75% of all production (Consultant, Pharmaceutical Industry, 2011) For example, on issuance of the compulsory license to Varichem in 2004, government promised to purchase 75% of locally manufactured ARVs, with the balance reserved for export to generate foreign currency for the company (Osewe *et al.*,2008). Economic challenges after the economic structural adjustment programmes and high inflation constrained government's financing ability for the public health system. This culminated in the collapse of the public health system (2003 to 2009) and high donor-dependence for financing public health systems and drug procurement (Managing Director 2, 2011). The greatest challenge for the local pharmaceutical industry capacity

utilisation was lack of procurement by government. This incapacitated the potency of public health drug procurement as an industrial development policy tool (NECF, 2010). Reliance on donor financing for the public health system and drug procurement poses a demand side constraint on local pharmaceutical manufacturing capacities and capabilities; I discuss this in chapters 5 and 8.

2.9 Zimbabwe's Local ARV Manufacturing Story

During the economic challenges of the late 1980s and 1990s, Zimbabwe faced a huge social and health challenge from the HIV/AIDS pandemic. The outbreak of HIV/AIDS placed a huge strain on an already overburdened health system and in response, the government set up the National Aids Council and the National Aids Trust, which collects and administers the AIDS levy set at 3% of salaries to finance the HIV/AIDS programmes[15]. Fifty per cent of the AIDS levy is reserved for procurement of ARVs, with the balance financing prevention and awareness programmes as well as administrative costs (ibid). On the back of these funds, the government pushed for local production of ARVs by issuing a compulsory license promising to purchase 75% of ARVs produced locally (Osewe *et al*, 2008).

The government approached local pharmaceutical companies to produce ARVs in 2002, whilst in the interim it imported ARVs (Marketing Director, 2011). Datlabs won the tender to import ARVs from Ranbaxy of India. Initially local companies pursued licensing negotiations with an Indian and European pharmaceutical company that had ARV technology (ibid). However, the negotiations were not successful and consequently they were forced to go the compulsory route (ibid). Osewe *et al.*, 2008 and the UNIDO (2011b) explore in detail the story of ARV manufacture in Zimbabwe and the policy steps taken (see Table 8). To summarise the process, in 2002, the government amended the Patents Act of 1996 to conform to provisions of TRIPS (Trade Related Intellectual Property Rights) and section 34 of the Patents Act 26.03 which provided for compulsory licensing

[15] http://www.nac.org.zw/about/funding, accessed 20 April, 2012

for government use (Osewe *et al.*, 2008; UNIDO, 2011b). A state of emergency was declared from January 2003 to December 2005, and the compulsory license was used to improve access to ARVs (Osewe et al., 2008). On the 8th of April 2003, the Minister of Justice authorised Varichem to produce ARVs and HIV/AIDS related drugs under a compulsory license and sell 75% of their production to State-owned health institutions (ibid). Varichem started manufacturing the combination ARV Varivar (Lamuvidine and Zidovudine) in July 2003 followed by Stalanev (combination of Stavudine, Lamuvidine and Nevirapine) in October 2003 and other ARVs as shown in Table 8 (Osewe *et al.*, 2008; UNIDO, 2011b). In a separate arrangement, Ranbaxy entered talks with Ingram in South Africa to form a joint venture and through technology transfer manufacture ARVs at Datlabs in Bulawayo (Marketing Director, 2011). The agreement between Ranbaxy and Ingram in South Africa fell through and Datlabs has not manufactured ARVs locally to date (ibid).

Four Zimbabwean pharmaceutical companies registered twenty generic ARVs with the Medicines Control Authority of Zimbabwe (MCAZ); Varichem (13), CAPS (4), Datlabs (1) and Plus 5 pharmaceuticals (2) (UNIDO, 2011b). Registration of ARVs does not mean the drugs are under production, but that companies have approved documentation to produce the drugs in Zimbabwe. Only Varichem is currently manufacturing ARVs and it is the sole supplier of locally manufactured ARVs (UNIDO, 2007, 2011b). CAPS used to manufacture Lamuvidine and Nevirapine but indications on the market are they have since stopped (Procurement Manager, 2011). The greater proportion of ARVs for the antiretroviral treatment (ART) programme in Zimbabwe, are imported from Indian companies such as Matrix, Ranbaxy, Cipla, Aurobindo and Hetero (Procurement Manager, 2011; AIDS Conference, September, 2011[16]).

[16] I attended the AIDS conference held at Celebration Centre in Borrowdale, Harare organised by the National AIDS Council (NAC) and observed the ARVs that the major Global Health partners were displaying, which incidentally were all supplied by Indian Manufacturers such as Hetero, Aurobindo and Cipla.

Date	Legislation or Production Development	Reason/Justification
2002	Patents Act of 1996 ammended to bring it into conformity with the provisions of TRIPS agreement. Section 34 of Patents Act, Cap. 26.03, provides for compulsory licensing and Government use. Minister may authorise use of patented invention by any Government department or 3rd party for services of state. Section 35: Any authorisation by Minister under section 34 during a state of emergence shall include power to make, use, exercise and vend the invention for any purpose which appears to the Minister necessary or expedient.	Public Health: Incorporate TRIPS flexibilities into Zimbabwe's domestic legislation, promote beneficial utilisation, including local production. Legal basis for Zimbabwe's strategy of moving towards reliance on local production of ARVs to solve affordable access challenges.
General Notice 240 of 2002. Official gazette published on January 17, 2003.	State of Emergence on HIV/AIDS from January 1 2003, to December 31, 2005. Intent of using Govt - use option to improve access to ARVs	Permitted State to make or use any patented drug, incl ARVs to treat HIV/AIDS related conds.
08-Apr-03	Letter signed by Minister of Justice to Varichem to produce ARV or HIV/AIDS related drugs, and supply 75% of its production to State owned Health Institutions.	Govt roll out of the drugs (Purchasing power) would be funded by budgetary allocations and AIDS levy (3% of gross salary). Pvt sector however relied on out of pocket payments, Private Health Insurance, assistance from NGOs (MSF) and international HIV/AIDS initiatives (Global Fund). Local production was meant to complement the import of generic ARVs (RSA and India). Target markets: regional countries; Malawi, RSA and Zambia.
Jul-03	Varivar (lamuvidine 150mg + Zidovudine 300mg)	Capacity as at 2008 was 1.15 billion tablets and capsules. Benefitted from government procurement through special dispensations of supplying Govt without going to tender. Government showed commitment by obtaining the greater portion of ARV supplies from Varichem. Prior to local manufacture costs per month were USD 30 to 50, Varivar however sold at just USD15 per month.
Oct-03	Stalanev (Stavudine 30/40mg + Nevirapine 200mg + Lamuvidine 150mg)	
Jun-04	Stavudine 30mg	
Jun-04	Stavudine 40mg	
Jun-04	Lamuvidine 150mg	
Sep-04	Nevirapine 200mg	
Mar-05	Zidovudine 300mg	
Sep-05	Indinavir 400mg	

Source: Osewe *et al.*, 2008

The portfolio of ARVs manufactured by Varichem pharmaceuticals is shown in Table 9. Table 10 shows locally manufactured ARVs in comparison to the recommended treatment regimens (MOHCW, 2010). What is apparent on scrutiny of Table 10 is that ARVs manufactured in Zimbabwe are predominantly first line treatment drugs falling under the broad classification of nucleoside reverse transcription inhibitors; Zidovudine (AZT, ZDV), Lamuvidine (3TC) and Stavudine (d4T). The other nucleoside reverse transcription inhibitors such as Emtricitabine (FTC), Abacavir (ABC) and Didanosine (ddI) are currently not being manufactured in Zimbabwe, neither are they under formulation development. The only nucleoside reverse transcription inhibitor that is under development activity is Tenofovir (TDF), and these are both adult and paediatric formulations (see chapter 5).

Table 9: Portfolio of ARVs manufactured by Varichem as at January 2012.

Product Description	Pack Size
Varivar Tablets (Lamivudine150mg / Zidovudine 300mg)	60s
Lamivudine150mg Tablets	60s
Nevaripine 200mg Tablets	60s
Stavudine 30mg Capsules	60s
Zidovudine 300mg Tablets	60s
Indinavir 400mg Capsules	28s
Varicomb Tablets (Lamivudine 150mg / Zidovudine 300mg/ Nevirapine200mg)	60s
Stalanev 30 Tablets (Stavudine 30mg/Lamivudine 150mg/Nevirapine 200mg)	60s

Source: Varichem website http://www.varichem.co.zw/products-anti-retrovirals.cfm accessed 15 February 2012.

Table 10: Recommended treatment regimens and ARV product profile manufactured, under development, and imported into Zimbabwe.

Portfolio Of ARVs Manufactured and Not Manufactured In Zimbabwe as at December 2011		
Nucleoside Reverse Transcription Inhibitors	**Non Nucleoside Reverse Transcription Inhibitors**	**Protease Inhibitors**
Tenofovir (TDF)	Nevirapine (NVP)	Lopinavir/Ritonavir (LPV/r)
Zidovudine (AZT, ZDV)	Efavirenz (EFZ)	Atazanavir/Ritonavir (ATV/r)
Lamuvidine (3TC)	Etravirine	Indinavir (IDV)
Emtricitabine (FTC)		Saquinavir
Abacavir (ABC)		Ritonavir (RTV)
Didanosine (ddI)		Darunavir
Stavudine (d4T)		
Fusion Inhibitor	**Intergrase Inhibitor**	**CCR5 Inhibitor**
Enfurvitide	Raltegavir	Maraviroc

Key To Colours In Table: ARV Manufactured in Zimbabwe | ARV Under Development in Zimbabwe | ARV Not Manufactured in Zimbabwe

Source: Guidelines for ART in Zimbabwe, NDTPAC & Aids and TB Unit MOHCW, May 2010; Field work, 2011).

For the non-nucleoside reverse transcription inhibitors, only Nevirapine (NVP) is manufactured in Zimbabwe, whilst Efavirenz (EFZ) is under formulation development. Etravine is not manufactured locally and is not under development. In the protease inhibitors class Indinavir (IDV) is the only ARV manufactured locally, whilst Lopinavir/Ritonavir (LPV/r), Atazanavir/Ritonavir (ATV/r), Saquinavir, ritonavir (RTV) and Darunavir are neither under development activity nor manufactured locally. The fusion inhibitor (enfurvitide), the integrase inhibitor (Raltegavir) and CCR5 inhibitor (Maraviroc) are all neither under development nor being manufactured locally (ibid). The significance of this is that the local pharmaceutical manufacturing company is debilitated when competing for tenders that include ARVs they currently do not produce. As a result foreign companies do not face any competition from local companies when it comes to the second line treatment.

Over the last decade, research and development activities in Zimbabwe were affected by the economic meltdown causing the portfolio of ARVs manufactured in Zimbabwe being

predominantly old first line treatment regimens such as Stavudine, which is being phased out (Consultant Pharmaceutical Industry, 2011). The hyperinflationary environment and collapse of the Zimbabwe Dollar meant severe erosion of the purchasing power of public health institutions, hence a loss of the demand for ARVs (ibid). As a result of lack of access to foreign lines of credit and technology transfer slow down, research and development activities ground to a halt, as did manufacture of second line ARV treatment regimens (Research and Development Director, 2011). I discuss this further in chapters 5 and 8.

Table 11: Early challenges to increased local ARV production.

Challenges to Initial Local Production Plans	
WHO Prequalification: First obstacle. Global fund disappointments.	GMP needed and quotation was USD 2.5million made available by UNDP.
Cost of conducting in-vivo bio equivalence tests with a company that is Internationally accredited.	Costs rose from US$ 10 000, to 15 000 and 20 000 as at 2008. This adds to the cost of local production.
Cost of APIs	Exports of ARVs were supposed to be a source of foreign currency as per government arrangements for importation of APIs. However due to lack of a viable external market (WHO pre-qualification albatross), the government was compelled to provide foreign currency for import of APIs, and then the economic challenges of 2004 onwards made it even more complex.
Funding for HIV/AIDS programmes	The roll out of HIV programmes has suffered from lack of international funding. Malawi and Zambia which have slightly lower rates of HIV/AIDS revalence than Zim have received more HIV/AIDS funding from the Global Fund.

Source: Osewe *et al.*, (2008)

According to Osewe *et al.*, (2008), some of the early challenges to increased local ARV manufacture were lack of WHO pre-qualification and resultantly an inability to participate in

Global Fund or PEPFAR funded tenders which required this qualification (see Table 11). Secondly, the costs of in-vivo bio-equivalence tests were steep as were the prices of APIs and excipients, imported from India and China. These imports require foreign currency, which was in short supply (ibid). The third hurdle was lack of funding for HIV/AIDS programmes as alluded to earlier (ibid). I return to discuss these in chapters 5, 7 and 8.

It is with this background in mind that I set to understand the financing of technological capability upgrading and innovation. I used the OECD (2005) definition of innovation which states that "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations". The Oslo Manual classifies innovation into four broad categories of; product innovations, process innovations, marketing innovations and organisational innovations (ibid). My focus on technological capability upgrading is within this framework of innovation.

2.10 Conclusion

In this chapter, I discussed African financial systems and African pharmaceutical manufacturing to give context to the study. I also discussed Zimbabwe's political economy, the rise of manufacturing, the financial architecture, financing of enterprises, pharmaceutical manufacturing and the story of ARV manufacture in Zimbabwe. In summary, the rise of manufacturing in Zimbabwe was linked to the agricultural and mining sectors as well as production of food production. The supply of repairs and substitution of imported equipment formed the basis for the development of manufacturing in Zimbabwe propelled by blockades of WWII and sanctions imposed after UDI. The financial sector developed to support trade and commerce modelled on the British financial system. Industrialisation was financed by FDI and foreign loans as subsidiaries of South African and British transnational corporates set up plants in Zimbabwe. Historically commercial banks have not played a critical role in financing industrial growth and development,

except for merchant banks, which competed with the Zimbabwe Development Bank in the long-term financing terrain. However, local bank-availed long-term foreign currency loans have historically been scarce. The pharmaceutical sector emerged around 1953 and has existed for six decades, ample time, all things being equal, for technological capability upgrading and innovation to take off, which has not occurred. There was scarcity of foreign currency to import state of the art technology (plant, equipment, and machinery). ARV manufacture started in 2003 through the compulsory licensing route, operating through a harsh economic environment as Zimbabwe went into hyperinflation. Consequently, the portfolio of ARVs under manufacture is predominantly the first line treatment regimen. The demand side for ARVs has been decimated by lack of finances for public health drug procurement, and the promised 75% of production uptake has not been forthcoming as the public health system became more reliant on the donor funding. Resultantly public health drug procurement could not be used as an industrial policy tool.

Chapter 3: Literature Review: Building the Theoretical Framework

"When a banker starts to study the theory of financial intermediation in order to better understand what he has done during his professional life, he enters a world unknown to him. That world is full of concepts, which he did not, or hardly knew before and full of expressions he never used himself: asymmetric information, adverse selection, monitoring, costly state verification, moral hazard .... He gets the uneasy feeling that a growing divergence has emerged between the micro economic theory of banking, as it took shape in the last three decades, and the everyday behaviour of bankers according to their business motives, expressed in the language they use" (Scholtens and van Wensveen, 2003)

3.0 Introduction

The quote above captures my dilemma as a former banking practitioner getting to grips with the theoretical underpinnings of my career and trying to synthesise a theoretical framework to study the complexities surrounding the financing of ARV manufacture in Zimbabwe. The theory of financial intermediation alone could not fully explain the practical and behavioural aspects of my banking experience. It could not unravel aspects of knowing, which product to use for which customer, interpersonal and interdepartmental linkages, reliance on old timers to give historical and unwritten explanations on certain institutional viewpoints and tacit aspects of knowledge involved in financing enterprises. As I argued in chapters 1 and 2, financing local African pharmaceutical manufacturing is not just about giving loans to borrowers, but at the financial institutions there are skills, expertise and lending technologies surrounding loan origination, credit risk management, monitoring and control and loan repayment. At the pharmaceutical company there are technological capabilities of investment and project finance involved in accessing finance.

In building the theoretical framework for this study, financial intermediation only could not explain the whole story; neither could innovation focusing on technological capabilities, nor economic, social, and financial history literature on its own. However, a synthesis of these diverse fields, including trade credit theory, and pecking order theory could build a rich theoretical framework to understand the complex story of financing technological capability upgrading and innovation in the manufacturing of ARVs in Zimbabwe. The advantage of the eclectic approach is the ability to cover the intersection of finance and innovation. However, with an eclectic theoretical framework there is always a risk that I am drawing from too large a spread of different literature. I tried to avoid this by giving emphasis to the literature that is pertinent to this study.

Calorimis (1995) argued that financing industrialisation in the second industrial revolution has contemporary applicability on the basis of two factors; first, during the second industrial revolution large amounts of finance were required to finance large scale production and distribution. Secondly, the new production methods in the second industrial revolution embodied new products and new technologies, which reflect the contemporary situation of pharmaceutical companies in developing countries (ibid). The novelty of the new products and technologies gives rise to informational opacity for non-technical people such as bankers. However, Calorimis' (1995) analysis adopts the same approach of just making it about getting money and in larger quantities for catch-up industrialisation. The requisite technological capabilities at firm level for the borrower and the financial institutional behaviours are not analysed. It is with this understanding, and with acknowledgement of the complexity surrounding local pharmaceutical manufacture that I built an eclectic theoretical framework to conceptualise and study the financing of ARV manufacture in Zimbabwe.

In this chapter, I discuss how I built the theoretical framework drawing from various bodies of literature including economic, social and financial history, financial intermediation theory, trade credit theory, pecking order theory, and technological capability framework.

I structure the rest of the chapter as follows: in section 3.1, I introduce the construction of the theoretical framework, whilst in section 3.2; I discuss sources of finance for companies from a historical perspective using economic, social and economic history. I highlight the fact that banks were a key source of external finance for enterprises. I also discuss trade credit theory as trade credit is a source of in-kind external finance for working capital requirements. In section 3.3, I discuss the critical role played by banks in industrial development, reinforcing the idea that banks were a critical source of external finance. Section 3.4 covers the pecking order theory, explaining how companies when they need external finance prefer bank debt first, then hybrid bonds and finally equity to preserve management control. I discuss financial intermediation theory in section 3.5 to explain what banks do, and how they do it and lending technologies. Up to this point all the literature I discuss concerns finance, but omits technological capabilities at pharmaceutical companies key to accessing finance. I therefore discuss in sections 3.6 the technological capabilities required by an enterprise to access finance and conclude the chapter with section 3.7.

3.1 Theoretical Framework Construction

As I mentioned earlier, using intermediation theory only would not give a rich picture of the complexities involved in financing local pharmaceutical manufacture. Taking a technological capability framework perspective only would not provide a rich picture either. I therefore combined economic, financial and social history literature, trade credit theory, financial intermediation theory, pecking order theory and Lall's technological capability framework to build the theoretical framework for this study. Fig 4 graphically presents the process of building the theoretical framework, showing a linear process but in reality, the process was iterative and involved preliminary desk research, and interrogating data in the field as the complexity of the study unravelled. Economic, social, and financial history, pointed to banks as the most prevalent source of external finance (see section 3.2) which led to financial intermediation theory to explain what banks do and how they do it. I also included trade credit theory to cover short-term in-kind finance provided by suppliers critical to financing working capital requirements. To understand

how companies choose external finance when internal finance is limited, I used the pecking order theory advanced by Myers (1984), and Myers and Majluf (1984).

As I discuss later in section 3.4 when companies need external finance their order of preference puts bank debt at the apex, followed by hybrid bonds and lastly equity as managers prefer to retain management control and reduce external control and accountability that comes with equity finance (Myers, 1984; Myers and Majluf, 1984). This reinforces the importance of banks as a primary source of external finance for firm growth. I use financial intermediation theory (see section 3.5) to explain what banks do and how they do it; covering issues of risk, risk transformation, liquidity transformation, maturity transformation, asymmetric information, and transaction costs (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Scholtens and van Wensveen, 2000, 2003). However, the literature above cannot explain the complexity of financing enterprises and industrial development such as technical skills in project finance for both pharmaceutical companies and banks. I used the technological capability framework developed by Lall (1992) which looks at firm level technological capability of investment (pre-investment and project execution), product engineering, process engineering, industrial engineering, and linkages with the economy (see section 3.7). The firm level technological capabilities interact with national level capabilities; incentives, and institutions (ibid).

Developed by author with ideas from: Lazonick and O'Sullivan (1997a; 1997b) Myers (1984), Santomero (2000) Bhattacharya (1993), Lall (1992).

Figure 4: Building the theoretical framework.

I now turn to an in depth discussion of the literature I used to build the theoretical framework.

3.2 Explaining Sources of Finance for Industry

Economic, social, and financial history literature reveals the sources of finance for setting up enterprises globally as internal or own finance made up of savings, wealth, and loans from family and friends (Corbett and Jenkinson, 1996; Lazonick and O'Sullivan, 1997a, 1997b; Trew, 2010). For growth, enterprises depended on retained earnings and banks were the most prevalent source of external finance (Corbett and Jenkinson, 1996; Lazonick and O'Sullivan, 1997a, 1997b). Exploring other possible sources of external finance for enterprises, Bhattacharya and Thakor (1993) listed venture capitalists, banks and capital markets with the key determining factor of type of financier being enterprises' management experience, skills and credit reputation (see Table 12). As Table 12 shows, in developed markets for start-up or emerging companies with un-established management and credit reputation and unknown future prospects, venture capital is the most appropriate source of capital (ibid). Growing companies with experienced management, poor to

good prospects for future prospects, medium to high risk and established credit reputations are likely to use banks as the source of external finance (ibid). Diamond (1991) posited that relatively new companies lacking a well-established reputation stand to gain the most from the monitoring activities of banks. Hence, they choose bank loans; whereas more experienced borrowers with a better reputation prefer to borrow from the capital market (ibid).

Table 12: Sources of capital for companies determined by age, management skill and credit reputation.

Sources of Capital for Companies At Different Stages Of Growth			
Attribute	**Venture Capitalists**	**Bank**	**Capital Market**
Type of Company	Start-Up or Emerging Company	Growing Company	Established Company
Management Skills	Unestablished Management	Experienced Management	Experienced Management
Prospects For the Future Profits	Unkown	Poor to good prospects for future profits	Good prospects for future profits
Credit Risk	Usually classified as high because of the unestablished management, lack of operational track record and relatively unkown future profits prospects.	Medium to High credit risk, as the company has some operational track record.	Deemed low credit risk, because of established operational track record and prospect for future profits.
Credit Reputation	Un-determined as the company is at the genesis stage.	In the process of establishing credit reputation.	Established reputation.

Source: Bhattacharya and Thakor (1993)

For established companies, with established credit records, low credit risk and run by experienced management, capital markets become the most probable source of capital (Bhattacharya and Thakor, 1993). Capital markets, though as argued by Lazonick and O'Sullivan (1997a, 1997b) did not play a major role in raising capital for industrialisation, except to a certain extent in the USA where bond finance was used in certain instances. Capital markets were mostly used to transfer ownership of corporates from family run or close knit ownership structures to public ownership rather than raise finance for industrialisation (ibid).

The main sources of finance for industry can thus be split into internal and external sources (see Table 13). Internal sources of finance as mentioned earlier, include own funds, loans from family and friends as well as retained earnings (Lazonick and O'Sullivan, 1997a, 1997b). External sources include bank finance (debt finance), securities (bonds, shares, and equity), trade credit and capital transfers (ibid). Another source of external finance critical especially for African industrialisation is foreign direct investment (see sections 2.7 and 3.2.3). The ultimate source of funds for industry are national savings composed of household and corporate savings, linked to the capital accumulation process (ibid). The other sources of external finance include the state and development financial institutions (see Table 13).

The challenge that many African countries face is the limitation of sources of external finance. Venture capital and capital markets in general are either absent or limited in their operations, limiting the major source of external finance to bank debt as financial systems are bank dominated (see chapter 2).

Table 13: Sources of financing for industry in developed economies.

Economic, Financial and Social History Literature: Sources of Financing Industrialisation and Institutional, Organisational and Architectural Dynamics			
Issue under consideration	**Sources of funds**	**What does it address/where did it occur**	**Key authors**
Sources of industrial finance	Internal finance (depreciation and retained profits), Bank Finance (Debt Finance), Bonds, Shares and New Equity (Securities), Trade Credit, Capital Transfers..	What were the sources of capital (finance) for start ups, growing companies and companies that were taking off hitorically. What were the organisational dyanamics	See for example foxwell (1917); Cohen (1967); Griffith-Jones and Rodriguez (1984); Calorimis (1995); Corbett and Jenkinson (1996); Lazonick and O'Sullivan (1997); Da Rin and Hellman (2001); Trew (2010)
Ultimate source of funds	National Savings: Corporate Savings and Investment as well as Household Savings and Investments:	The capital accumulation process is therefore critical to financing industrialisation and determines whether a locally driven or external financing strategy will be employed in financing the industrialisation process.	
The State as a source of finance	State can leverage the fiscal process and long term borrowing to finance infrastructure and industry.	The entrepreneural state or the interventionist state	
Financial and other institutions involved	Bank-Based Financial System Architecture: Commercial Banks, Merchant Banks/Investment Banks, Finance Houses, Discount Houses, International Financial Institutions, and Regional Banks.	Germany and Japan	
	Market-Based Financial System Architecture: Stock Exchange, Merchant Banks, Brokers, Law Firms, Corporate Finance Firms, and FDI.	Anglo-Saxon financial system: UK and USA	

In the next section, I turn to internal sources of finance in brief.

3.2.1 Own and Internal sources of finance for industrial development

Sources of finance for early and late industrialisers can be glimpsed from *Allen et al.*, (2010) who listed them for the UK, USA, Germany and Japan as banks, securities markets, internal finance, trade credit, families and friends, and governments (see Table 13). As mentioned earlier the prevalent source of finance for start-up enterprises was own finance, with internal finance the most common source for enterprise growth (ibid). This undergirds the British first industrial revolution financing model where wealthy merchants funded the genesis of companies, turnpikes, and canals (Corbett and Jenkinson, 1996, Lazonick and O'Sullivan, 1997a and 1997b, Trew, 2010). Gowland (1998) classifies this as an informal capital market where entrepreneurs approach rich citizens to finance a project. On the other hand, internal finance accounted for the following proportion of finance to enterprises: Japan (57.9%), Italy (51.9%), France (61.4%), US (85.9%), UK (102.4%), Germany (70.9%), Finland (64.4%) and Canada (76.4%) (Corbett and Jenkinson, 1996; Lazonick and O'Sullivan, 1997a, 1997b). Companies therefore grew through reinvestment of earnings (retained profits). Corbett and Jenkinson (1996) in their international comparison of financing industrialisation between 1970 and 1989 reported that most countries internally financed their enterprises with contributions from the capital markets being either negative or small. However, Japan had larger contributions from all external sources (ibid).

This presents a challenge for most African countries, which cannot internally finance industrial development, because of what Ndlela (2007) terms the prevalence of dis-articulated economies in Africa. Ndlela (2007) argues that because of colonisation, African countries experienced grafted capitalism and their societies did not go through social changes that developed countries experienced. Resultantly commodification did not occur at the same magnitude in Africa as was the case in developed countries. The bulk of the population is poor, subsisting on peasantry and the informal and sectors which are not integrated into the formal economy (ibid). The formal economy is mostly based

in urban centres where 30% and at most 50% of the population resides (ibid). The accumulation process is slow and many African countries find it difficult to accumulate capital to finance industrialisation, hence the reliance on FDI and foreign loans (ibid). These stylized facts imply that until such a time that African economies cease to be dis-articulated, and can integrate the peasant, informal and formal economies, then accumulating capital to finance technological capability upgrading, and innovation will remain a challenge. This emanates from the critical role played by national savings and household wealth (accumulation process) in financing industrialisation from local resources. Data on financing manufacturing industry in seven countries in sub-Saharan Africa indicates that FDI and external/offshore finance were the main sources of capital, reinforcing Ndlela's (2007) argument (Riddell, 1990). Dailami and Walton (1989) however, put a caveat to this assertion that national savings are key to internal financing of industrialisation. They argued that the problem that African countries face is shortage of foreign currency to import technology for industrialisation (ibid). I return to this discussion in chapter 8, when I analyse Zimbabwe's sources of capital investment and the role played by banks.

3.2.2 External sources of finance

Bank credit was the most prominent source of external finance, except for USA where capital markets played some role (Corbett and Jenkinson, 1996; Trew, 2010). However, Lazonick and O'Sullivan (1997a) argue that in the USA, capital markets were used mostly to transfer ownership for going concerns established by own resources and grown using internal resources. Reinforcing the importance of bank finance, Corbett and Jenkinson (1996) reported that from 1970 to 1989, bank finance was the second most significant source of finance in most countries, particularly in bank-based economies such as Japan and France. Bank finance was also more significant than capital markets in Germany where joint-stock credit banks played an influential role in capital formation (Burhop, 2006). Gorton and Winton (2002) also support the idea that banks were the most prominent source of external finance in many countries. For example, between 1970 and 1985 bank finance, as a proportion of sources of finance in a number of countries was as follows: Japan (50.4%), Italy (27.7%), France (37.3%), US (24.4%), UK (7.6%), Germany (12.1%), Finland (28.1%) and Canada (15.2%) (ibid).

These results concur with African enterprise financing studies by Fafchamps *et al.*, (1995) where they found out that of all external financing sources, bank finance was the most prevalent. Lazonick and O'Sullivan (1997a) reported that merchant banks in the UK (the equivalent of US Investment banks), did not finance domestic industry but financed international trade and commerce. In Japan however, the Industrial Bank of Japan financed critical national policy companies and acted as a lead bank in syndications (Lazonick and O'Sullivan, 1997b). This may be the cue that countries like Zimbabwe are taking by proposing the establishment of an Industrial Development Bank to finance industrial development (ZIDP, 2011).

Capital markets (bonds and stocks) were not a significant source of funds for enterprises globally (Lazonick and O'Sullivan, 1997a, 1997b). As argued earlier (see section 2.3) capital markets are of little significance to African contexts because of their small-scale nature and low capitalisation (Fafchamps *et al*, 1995). Considering the general African context, (see section 2.3) venture capital and capital markets are more the exception than the norm, ruling them out as common sources of capital for industrial development. One of the key sources of external finance at national level as discussed in section 2.7 is FDI, which can embody technology flows (Portelli and Narula, 2004). FDI as discussed earlier was critical in the set-up of the manufacturing industry in Zimbabwe (see section 2.7). Portelli and Narula (2004) pointed out that FDI is important for technological upgrading prospects for developing countries through technological spill overs. They defined FDI as a "combination of capital, stock, know-how and technology" and posited that for developing countries it represented a critical means of acquiring modern technology (ibid). Reflective of the role of multinationals in industrial development in Zimbabwe, Narula (1997) asserted that foreign investment embodied in multinational companies played a key role in the Nigerian economy, as between 1963 and 1972, of the total national capital, 65% was held by foreign companies. The major sources of FDI in Nigeria in 1975 were United Kingdom (38%), USA (22%), and other Western European countries (26%) (ibid). FDI therefore serves as the easiest mode of killing two birds with one stone; the developing country does not finance the importation of technology, and the investor brings in the knowledge and skills required to operate the technology. However, the challenges to this approach are assertions that FDI does not transfer technology as effectively through learning by doing, as multinational corporates tend not to reveal the

innovation process but are more interested in application of technology thereby limiting technological knowledge overflows.

Another source of in-kind external finance is trade credit advanced by suppliers of goods. I discuss this in the next section.

3.2.4 Trade credit as a source of in-kind short-term external finance

Trade credit is a source of short-term, external in-kind finance to companies availed not as money but as goods on credit (Berlin, 2003; Gianetti *et al.*, 2011; Peterson and Rajan, 1997). Trade credit is therefore a peculiar form of short-term loan advanced by suppliers rather than banks (Nilsen, 2002). The buyer's ability to manage payment flows through a formalised delayed payment mechanism (trade credit) from the supplier causes the buyer to reduce cautionary holding of cash for goods payment alleviating cashflow problems and the need to borrow from banks (ibid). Suppliers unlike banks have an advantage because they advance goods and not money, averting diversion of funds risk faced by banks, which lend money (Berlin, 2003).

Smith (1987) defined trade credit as "a contractual device for dealing with informational asymmetry in intermediate goods". Smith puts traditional explanations of trade credit into two groups; the financing motivation explanation and the pricing motivation explanation (ibid). Suppliers with market power and reputation access formal credit from banks and extend trade credit (in-kind finance loan) to buyers allowing suppliers to price discriminate using credit (discounts systems) (Petersen and Rajan, 1997, Nilsen, 2002, and Gianetti *et al*, 2004). Suppliers thus provide capital to buyers unable to raise funds from financial intermediaries (Nilsen, 2002, and Gianetti et al, 2004). Trade credit is also a screening and monitoring device in suppliers' relationships with buyers (Berlin, 2003; Petersen and Rajan, 1997). The fact that there are more suppliers better at evaluating credit than there are financial intermediaries makes trade credit an important source of finance (Berlin, 2003; Petersen and Rajan, 1997). Suppliers

by extending credit to buyers reduce transactional costs making business transactions cheaper and easier (Peterson and Rajan, 1997; Berlin, 2003; and Gianetti *et al.*, 2011).

Superior information theory of trade credit ascribes a superior ability to sellers' information gathering ability over financial institutions (Gianetti et al., 2011). Sellers can monitor the default risk of the buyer through frequency of order placement, and have more up to date information on company performance through order placement (ibid). If buyers fail to take advantage of early payment incentives this acts as an early indicator of deteriorating company performance (ibid). Gianetti *et al* (2004) however argue that the source of the supplier's informational advantage emanates from an input completion thesis, where the supplier unlike other lenders automatically becomes aware when the transaction has been completed and thus averts moral hazard, which arises due to interim information asymmetries unlike the financial institutions which do not possess the ability to do the same expeditiously. Other theories of trade credit include control theory, which emphasises the ability of the supplier compared to financial institutions to exercise control over the buyer through threat of withdrawal of supplies provided the buyer does not constitute a huge portion of the seller's sales (Peterson and Rajan, 1997). This argument, however has shortcomings when one considers a short-term facility such as an overdraft or a revolving loan where the financial institution can also threaten either early repayment or lower the limits set on the facility as a tool for reinforcement thus exhibiting some form of control. Another theory for trade credit is the salvage capability theory, which gives an advantage to the sellers' ability to get back their supplies in the event of non-payment and selling them off to another buyer (Smith, 1987; Peterson and Rajan, 1997, and Gianetti *et al*, 2004). However, in the event of bankruptcy this is not easy unless the goods were sold on consignment, as other creditors would have claim to the assets of the company including inventory (Smith, 1987; Peterson and Rajan, 1997, and Gianetti et al, 2004).

For companies in poorly developed markets, Fisman and Love (2003) assert that trade credit provides an alternative to traditional sources of funds such as banks. They showed that industries that exhibited elevated dependence on trade credit were in countries with poorly developed financial markets (ibid).

These findings concur with Fafchamps *et al's.*, (1995) enterprise financing findings in Zimbabwe, which revealed trade credit was a key source of external finance for enterprises. Fafchamps *et al's* work shows trade credit use in African enterprises, and especially important for this study that trade credit was active in Zimbabwe. Trade credit is a source of in-kind finance that companies in developing countries can leverage to reduce expensive bank finance. If pharmaceutical companies in Zimbabwe can access trade credit, they could control financing and manufacturing costs by reducing cost of bank finance and consequently boost price competitiveness.

3.3 Critical Role Played by Banks in Financing Industry

In the previous sections, banks have emerged as the most prevalent source of external finance for industry globally and even in African contexts. In this section, I briefly discuss the critical role that banks played in financing industry globally.

The question of finance influencing and modernising industry has been topical for centuries including the most appropriate model for financing industrialisation and economic growth (Cameron 1967; Cohen, 1967). The works of Patrick (1966); King and Levine (1993) demonstrated a close link between a country's financial system and economic growth. The role of financial systems in economic development, has been extensively investigated, with commonly cited examples being Belgium, Germany, Italy, Japan, Taiwan, and South Korea (Da Rin and Hellman, 2002; Allen and Carletti, 2008). The debate is, which should come first, financial deepening or economic development? Levine (2002), argues that particularly in the early stages of development, bank based financial systems encourage economic growth and industrial development at a higher rate compared to market based systems. Da Rin and Hellman (2002) presented a theory of banks as catalysts for industrialisation, by formalising the Gerschenkron and Schumpeter argument that banks promoted creation of new industries. The banks however needed to be of sufficient large size, enjoying sufficient market power, able to mobilise resources and make profits from coordination processes (ibid). Governments and corporations were two alternative catalysts to banks for industrialisation (ibid). Gerschenkron (1962)

earlier on had given importance to the pivotal role played by banks in development of new markets, industries and economic growth (Da Rin and Hellman, 2002). Industrial development was accelerated as financial intermediaries mobilised savings, evaluated projects, managed risk, monitored managers, and allocated resources to investors (see section 3.5) (ibid).

King and Levine (1993) showed that financial systems deepening can promote economic growth (supply leading concept) and conversely economic development could accelerate financial development (demand following concept). The supply-leading phenomenon, they asserted was most prevalent in less developed countries (Gershchenkron, 1962; Patrick, 1966). Calderon and Liu (2002) investigated the direction of causality between financial development and economic development (termed 'Patrick's problem'), and their investigation revealed the following five observations:

a. Financial development leads to economic development,
b. Dual nature of causality co-exists,
c. Financial deepening contributes more to the causal relationships in developing countries than in industrial countries,
d. The longer the sampling period, the larger the effect of financial development on economic development.

They argued that financial deepening accelerates economic growth because of rapid capital accumulation and productivity growth, with productivity being the strongest (ibid). As discussed in the preceding sections, banks are key sources of external finance for industrial development and they are also the dominant financial institution in African financial systems. If in developing countries, the supply-leading phenomenon is more important for economic development (King and Levine, 1993), this further reinforces the importance of banks as potential financiers of industrial development in Africa. Reinforcing this argument, Bertocco (2003) asserted that banks and credit are fundamental elements of an economic system and critical to industrial development and economic growth. Bertocco (2003) further argued that banks and entrepreneurial innovators shoulder the responsibility of choosing which investments materialise and thus their actions influence industrial and economic development.

What this discussion brings to the fore is the critical role played by banks (financial intermediaries) in mobilising resources, evaluating projects, allocating resources to investors and the concomitant monitoring of managers and risk management (see section 3.5). From this perspective, financial institutions in developing countries can play a critical role in financing industrial development and economic growth, hence the focus of this study on the role played by banks in financing ARV drug manufacture in Zimbabwe. The Zimbabwean financial system was reputed to be highly developed (see section 2.6) and as such in the absence of the traditional FDI, banks are the most likely source of finance for industry (Dailami and Walton, 1989).

3.4 Pecking Order Theory

Prasad, Green, and Murinde (2001) argued that at firm level, financing policy dictates that management identify avenues of financing investment, and the choices available to managers include internal and external sources of funds. Internal funds come from retained earnings, depreciation, or fresh equity injection from existing shareholders (ibid). External funds include bank debt, hybrid bonds, or issuing of new equity to new shareholders (ibid). When internal funds are limited, management sources external finance, and the pecking order theory explains using management control the basis for external finance choice ranking (Myers, 1984; Myers and Majluf, 1984). Myers (1984) and Myers and Majluf (1984) posit that companies choose the most optimal financing structure that minimises information costs and this leads to the pecking order theory whose conclusions are that in the presence of asymmetric information:

(i) Firms' first choice of finance are own resources such as retained earnings or profits

(ii) If self-financing is inefficient to fund investment, then firms' second choice of finance is acquisition of external debt instruments, firstly, bank debt, then hybrid bonds, and the last option is new equity.

Companies, for fear of management control dilution, prefer to use internal sources of finance (retained earnings and profits) for expansion, as this enables them to maintain management control

(ibid). In the event that internal sources of funds are limiting, they prefer to obtain bank debt first, then hybrid securities such as convertible bonds as these have less management control dilution or external accountability (discipline and reporting) issues compared to accessing funds from the stock exchange, which is the final resort for external financing (ibid). Equity is taken as a last resort because of the onerous reporting standards and controls imposed on management and the attendant agency issues that arise when dealing with broad shareholding structures and professional managers as agents of shareholders (Bertocco, 2003; Myers, 1984; Myers and Majluf, 1984).

The pecking order theory in my theoretical framework links firm level technological capability of investment with banks as the preferred first source of external finance and maybe the only source of external finance in certain African contexts (see section 3.6). As discussed earlier capital markets are low key in many African countries, effectively ruling out hybrid securities and equity.

In the next section (3.5), I turn to financial intermediation theory and discuss what banks do, how they do it by discussing contemporary banking and financial intermediation theories.

3.5 Financial Intermediation

As demonstrated in previous sections, banks were the most prevalent source of external finance for enterprises and are thus critical for industry and economic development (Corbett and Jenkinson, 1996; Lazonick and O'Sullivan, 1997a, 1997b). Companies in need of external finance prefer bank debt to external equity to avoid dilution of management control and onerous reporting and accountability issues (Myers, 1984; Myers and Majluf, 1984). In this section I discuss what banks do and how they do it by looking at contemporary banking and financial intermediation theories.

Thakor (1996) from a brokerage services perspective defined a financial intermediary as an institution that provides brokerage services when it intermediates in financial transactions without changing the nature of the transacted claim. From a qualitative asset transformation services perspective, the financial intermediary intermediates processes but qualitatively changes the nature of the claim (ibid). Financial intermediaries can be classified as depository or non-depository institutions involved in payments, information collection, loan origination and loan advances, underwriting and risk sharing amongst other functionalities (Allen and Gale, 2004). Depository financial intermediaries accept deposits, invest them in loans and securities, whilst non-depository financial intermediaries are involved in financial transactions and services, but do not raise deposits (ibid). Depository financial intermediaries include commercial banks and savings banks, whereas financial institutions such as insurance companies, mutual funds, pension funds, rating agencies and financial advisors exemplify non-depository institutions (ibid). Fama (1980) defined banks as "financial intermediaries that issue deposits and use the proceeds to purchase securities", a definition echoing Pyle's (1971) description of essential characteristics of a financial intermediary as an institution that issues claims on itself and uses the proceeds to purchase other financial assets. Wray (2010) augments this definition by listing five essential activities played by financial institution in an economy as follows:

a) A safe payments and settlements system, which in many economies, is managed by commercial banks.

b) Provision of short-term loans to households, companies, and governments.

c) A system for availing mortgage finance for housing.

d) Complementary financial services to the ones mentioned above such as pensions, brokerage and insurance schemes.

e) Funding of capital assets through long-term finance from respective financial institutions.

There has been a gradual broadening of the theory of financial intermediation to cover not only the facets mentioned above but to explain asymmetric information, maturity transformation, risk

transformation and risk management roles of financial intermediaries (Allen and Santomero, 1997, 2001; Scholtens and van Wensveen, 2000, 2003).

I discuss this in the next section by looking at theories that shift the focus from information asymmetry and transaction services to amelioration of risk, risk transformation, and risk management.

3.5.1 Contemporary banking and financial intermediation theory

Haubrich (1987) posited that banks enter long-term relationships with borrowers but not with depositors, and in the long-term relationships, which he likened to marriage, banks acquire proprietary information which is difficult to pass on or transfer to other lenders. The major functionalities of financial intermediaries hence revolve around dealing with asymmetric information, risk transformation, maturity transformation, and risk management as they ameliorate moral hazard and adverse selection (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Scholtens and van Wensveen, 2000, 2003). Financial intermediaries thus play a critical role in the economy; not only of mobilising savings and re-allocation to investors but transforming and managing risk leading to them being viewed as economic units that add value to their clients through the activities of risk transformation and risk management (Allen and Santomero, 1997, 2001; Scholtens and van Wensveen, 2000, 2003).

The financial instruments that financial intermediaries deal with in an economy include; bonds, notes and bills issued by governments; deposits and acceptances issued by banks; equity, bonds, convertibles, preferred stock, commercial paper, and warrants issued by companies and finally commodity futures issued by exchanges (Allen and Santomero, 1997). Allen and Santomero (2001) divided financial assets into three classes; those held by depository institutions (banks), those held by non-bank intermediaries (for example pension funds and insurance funds and mutual

funds) and thirdly, assets directly held by households (stocks and bonds). Financial intermediaries mediate the transactions of the aforementioned assets between savers and investors (ibid). Reinforcing this, Gorton and Winton (2002) posited that in capitalist economies, the process of savings and investment is managed by and through financial intermediaries using debt contracts when dealing with both savers and borrowers. This is different to capital markets where investors contract directly with companies resulting in marketable securities (ibid). Allen and Santomero (2001) pointed out that in certain economies such as UK and USA; households no longer deal directly with investors but indirectly with the market through pension fund, mutual fund and insurance fund management agents.

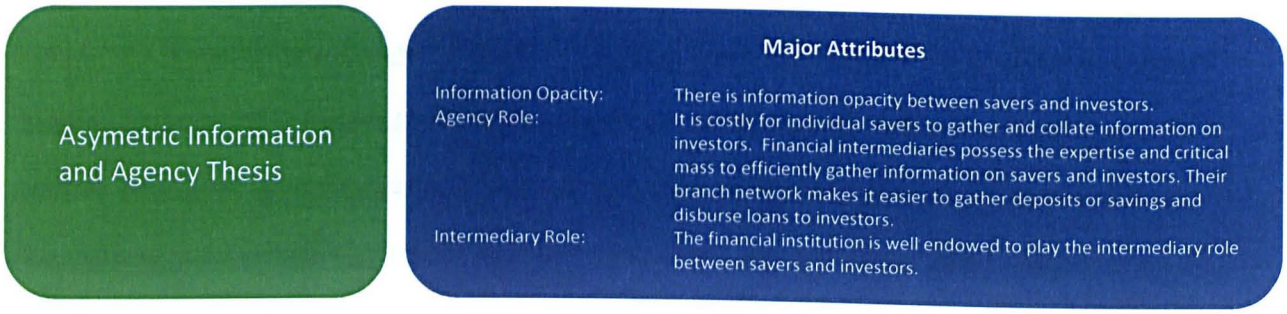
Major reviews of contemporary banking and financial intermediation theories have been done by Santomero (1984), Bhattacharya and Thakor (1993), Allen and Santomero (1997 and 2001), Scholtens and van Wensveen (2000 and 2003), and Gorton and Winton (2002) amongst others. Gorton and Winton's (2002) treatise is extensive and goes into great detail on financial intermediation explaining why banks exist, what they do and how they do it at the micro-level. The discussion on the theory of intermediation in this thesis will revolve around theoretical thrusts by the aforementioned authors. Some authors built their arguments on imperfect markets, and informational frictions emanating from asymmetric information, transactional costs, maturity transformation, liquidity transformation, risk transformation and risk management activities (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Gorton and Winton, 2002; Santomero, 1984; Scholtens and van Wensveen, 2000 and 2003; Wray, 2010).

Different approaches to factors mentioned above resulted in different theories of financial intermediation. The dichotomy comes from the approach to markets and the role of intermediaries as agents in a static system where they owe their existence to imperfect markets and the need to have an intermediary (agent) with advantages in information collection and management as well as advantages in transactional costs emanating from informational frictions (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Gorton and Winton, 2002; Santomero, 1984). The

second perspective is of intermediaries as active economic units that add value to their borrowers and lenders in a dynamic system through systematic risk transformation and risk management (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Gorton and Winton, 2002; Santomero, 1984). The early paradigm of understanding financial intermediaries was built on asymmetric information and transactions costs theories (Diamond, 1984; Diamond and Dybvig, 1986; Leland and Pyle, 1977). Leland and Pyle (1977) posited that borrowers (entrepreneurs) have an advantage because they possess better knowledge about their projects than do financiers or outsiders hence the existence of information asymmetries. Entrepreneurs as specialists in their business possess better quality information on their collateral, business acumen, moral conduct and risks they face compared to lenders or outsiders (ibid). In as much as lenders may want to know information possessed by borrowers, moral hazard acts as a barrier retarding full information exchange between market participants (ibid). Information asymmetries are more pronounced in financial markets than in other markets, and external verification of the true business status may be costly leading to the transaction costs theory on financial intermediation (ibid).

Scholtens and van Wensveen (2000, 2003) characterised the types of information asymmetries as either *ex-post* or *e- ante*. *Ex-post* information is information gathered after the event, based on knowledge of the past, whereas *ex-ante* information is information before the event, or based on prior assumptions (ibid). Consequently, *ex-ante* informational asymmetry leads to adverse selection, interim information asymmetry leads to moral hazard, whilst *ex-post* information asymmetry results in costly exercises of audit, state verification and enforcement (ibid). Interim information asymmetry emerges through on-going monitoring of revolving loans. These information asymmetries and transaction costs result in the need for a financial intermediary, which can leverage economies of scale to reduce information monitoring costs by accumulating proprietary information and reduce transaction costs compared to each individual investor trying to do the same (Diamond, 1984). Diamond's (1984) theory of financial intermediation was premised on minimising informational costs to resolve incentive problems (cost advantage). A financial intermediary, for example a bank was delegated the task of monitoring loan contracts, avoiding duplication if each individual investor was to do it or the free rider issue where no investors

monitored the lender (ibid). Monitoring the loan contract; an exercise that includes tracking loan covenants, surfaces the delegated monitoring function of the intermediary through collection and analysis of proprietary information (see Fig 5) (ibid).

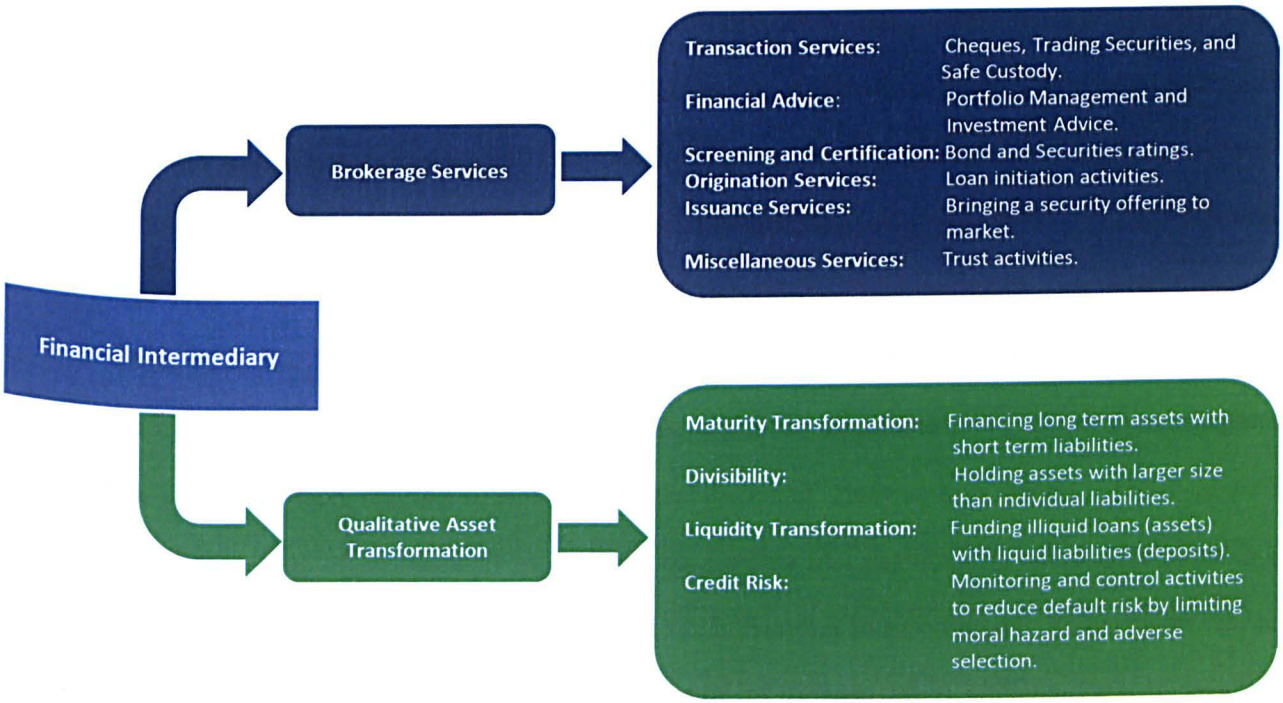


Source: Leland and Pyle (1977) and Diamond (1984)

Figure 5: Asymmetric information and agency explanation of financial intermediation

Diamond and Dybvig (1986) argued for a synthesis of banking theory built on asset services, liability services and transformation services. The asset services made available to the borrowers included; evaluation, granting of loans and subsequent monitoring and control of loans, whilst liability services provided to depositors encompass; holding deposits, clearing transactions, holding an inventory of currency, and services flows (ibid). Transformation services described maturity and liquidity transformation services where short term liquid deposits are used to fund long term illiquid loans, described as the most subtle and important exclusive functionality of banks; as it is one of the key triggers on a run on the bank (ibid). Thakor (1996) and Allen and Santomero (1997) avoided this synthesis as they thought it was an artificial classification which became blurred considering the sophistication in financial intermediation.

Bhattacharya and Thakor (1993) in their review of financial intermediation theory came up with six key issues to explain the existence of financial intermediaries; credit allocation, liquidity transformation, maturity transformation, bank regulation, and borrower's choice of finance (see Fig 6).



Source: Bhattacharya and Thakor (1993)

Figure 6: Brokerage services and qualitative asset transformation model of financial intermediation.

Bhattacharya and Thakor (1993) reviewed literature spanning 15 years on contemporary banking and financial intermediation theory, and argued that informational asymmetries were the most basic form of transactional costs, and consequently informational-based theories of financial intermediation gave a more fundamental explanation. They organised the literature in six categories namely; why financial intermediaries exist, credit allocation activities, liquidity transformation, maturity transformation, bank regulation and borrowers choice of financing and market microstructure (ibid). On why financial institutions exist, Bhattacharya and Thakor (1993) argued that financial intermediaries provide qualitative asset transformation and brokerage services (see Fig 6). The brokerage function involves bringing together savers and investors and does not change the nature of the transacted claim, whereas in qualitative asset transformation the claim being transacted involves risk (ibid). Financial intermediaries accept short-term liquid deposits on the back of which they issue long-term illiquid loans, a process involving maturity and liquidity

transformation hence the emergence of risk (ibid). In maturity transformation a bank funds loans (bank assets) of a longer maturity with bank liabilities (deposits) of a shorter maturity, and the bank's reward emanates from charging for bearing interest rate risk and creating liquidity for the borrower (Thakor, 1996). Liquidity transformation is the process where short term liquid deposits are converted into long term illiquid loans by the financial institution; the depositors through a debt contract give short term liquid resources to the bank, and the bank in advancing liquidity to the entrepreneur or investor converts liquid deposit into an illiquid asset (bank loan) (Bhattacharya and Thakor, 1993). Banks as depository financial institutions tend to provide both brokerage and qualitative asset transformation services whereas non-depository financial institutions operate in a narrow range (ibid). The process of intermediation in the Bhattacharya and Thakor (1993) model of financial intermediation arises because of informational frictions in the market and hence the need for an agent to intermediate.

Allen and Santomero (1997) argued that traditional intermediation theories based on transaction costs and asymmetric information, were designed to explain financial institutions that accepted deposits or insurance policies and advanced the collected funds to companies. However, this explanation fell short in explaining developments in the financial services sector where although transaction costs and asymmetric information had declined, intermediation had increased (ibid). If intermediation owed its existence to transaction costs and asymmetric information, there was no rational basis for intermediation to increase since transactional costs and information asymmetries were declining they argued (ibid). In addition, innovations in the financial industry were building new markets of financial futures and options, which were the preserve or domain for exchanges purely between financial intermediaries themselves, which did not involve individuals or companies (ibid). Therefore, there was a need to discuss the role of intermediaries using risk trading and participation costs rather than traditional transactions costs and asymmetric information (ibid). To reinforce this argument Allen and Santomero (1997) pointed at the rising share of assets held by Mutual Funds and Pension Funds compared to share of assets held by banks and insurance companies which had fallen. They argued that there had been a shift in activities to risk transfer and participation costs instead of traditional asymmetric information and transactional costs (ibid).

They cited the emergence of securitisation of loans where one intermediary originated a loan, packaged it and sold it off to another intermediary, which traded the securitised loan on the secondary market (ibid). Another institution was contracted as a broker to collect the repayment of principal and interest on a commission basis, without holding the loan on its balance sheet (ibid). These financial innovations could not be explained by traditional transaction cost and asymmetric information theories.

Allen and Santomero's (1997, 2001) approach brings out the dichotomy of functional versus institutional activity as a basis for theory building. It explains the different approaches of Bhattacharya and Thakor (1993) of asymmetric information and transactions costs, the distribution of risks amongst participants and even the Allen and Santomero (1997, 2001) risk transfer, emphasising risk management and participation costs. Allen and Santomero (1997, 2001) argue that a functional theory building approach is better than an institutional theory building approach, as functions are more stable than institutions. Institutions come and go but functions in spite of innovation are more long lasting (ibid). For example, they argue a functional approach would look at financial intermediation from the aspect of loan origination, distribution, servicing and funding which have remained stable than the institutions administering these services (ibid). Allen Santomero (1997, 2000) further argued that using a functional approach; literature on transactional costs could be rationalised through viewing the role of the institutions in distribution, and the asymmetric information role as activities around origination and servicing of loans. Hence the proposal that financial intermediaries act as facilitators of risk transfer and deal with complex financial instruments and markets, and risk management as the central issue in intermediation (ibid).

Scholtens and van Wensveen (2000, 2003) critiqued Allen and Santomero's (1997, 2001) theory of financial intermediation built on risk trading, risk management and participations costs arguing that risk management was not a recent development or phenomenon to the financial sector and also against the concept of participation costs assuming a pivotal role in intermediation. They agreed

with Allen and Santomero's (1997, 2001) functional approach rather than institutional approach to theory building (ibid). However, they argued that Allen and Santomero's (1997, 2001) assertion that risk management was a recent occurrence in the financial sector and making participation costs central to a contemporary theory of financial intermediation was not a complete analysis (Scholtens and van Wensveen 2000, 2003). They argued that the paradigm of complete markets giving financial intermediaries a role because markets are imperfect, or existing by "the grace of market imperfections" was flawed (ibid). This logic implies that as soon as markets become perfect financial intermediaries become redundant; because savers and investors would have perfect information to identify each other and transact without the need for an agent or intermediary but in reality this is not so (ibid). The situation in practice is anything but the above; in fact, financial intermediaries broadly, instead of a tendency towards redundancy are re-inventing themselves, innovating to stay relevant, and taking a prominent role in modern economies argued Scholtens and van Wensveen (2000 and 2003). They asserted that it was erroneous to interpret the relative declining role of banks in the US context as a sign of general disintermediation when one considers the fact that financial innovation resulted in certain assets being off-balance sheet amongst other factors (ibid). The use of an institutional lens could be the reason for this erroneous analysis, as the functional analytical framework shows that financial intermediaries are of increased importance to the modern economy (ibid). They also asserted that the argument on participation costs is weak, as participation costs cannot explain the dramatic rise in mutual funds and the widespread use of derivatives (ibid). Banks were active in initiating or originating loans (deals), arrangement of deals, underwriting instruments, maintenance of a secondary market, innovation and production of a variety of both on and off-balance sheet products derived from securities, clearing deals, settlement and payment, offering custodian services, and providing stock lending (Scholtens and van Wensveen 2000, 2003; Burhop, 2006).

Scholtens and van Wensveen (2000, 2003) agreed with Allen and Santomero's (1997) intimation that risk assumes a pivotal role in financial intermediation and the focus on risk management research, as risk is the reason d'etre of financial intermediation. Risk thus becomes the foundation of functions such as insurance and hence the genesis of banking lies in the risk transformation and risk management activities as evidenced by the merchant bankers of the Italian renaissance and the

insurance of goods shipped overseas (ibid). The essence of savings and loan associations, they argued, is steeped in risk management, encompassing interest rate risk, credit risk as well as liquidity risk, thus making risk the main business (ibid). They advocated that risk takes the central place in the theory of financial intermediation and a change from the static perfect markets as discussed earlier to a dynamic concept where new markets are developed for new products (ibid). Financial intermediaries are therefore economic units that add value to their clients through spatial, temporal, geographic and liquidity risk transformation and risk management (ibid).

The Scholtens and van Wensveen (2000 and 2003) theory of financial intermediation therefore involves a paradigm shift to a dynamic concept of defining financial intermediaries as entrepreneurial providers of financial services that are value creating economic units operating in a dynamic market. The market is characterised by market differentiation, new products, product innovation, with a focused customer orientation towards both borrowers and savers, and majoring in risk transformation and risk management (ibid). The financial intermediary still deals with agency problems manifesting through adverse selection and moral hazard as part of the risk function in the value addition process (ibid). This approach divorces the financial intermediary from the passivity ascribed to it by the traditional static information asymmetry and transactional costs model and gives financial intermediaries an active, entrepreneurial value-adding role in the economy as a risk transformer and risk manager (ibid). The Scholtens and van Wensveen (2000 and 2003) model puts risk and risk management at the core of intermediation with some of the risks dealt with including but not limited to maturity risk, counterparty risk, market risk (interest and stock prices), life expectancy risk and income expectancy risk. Financial institutions thus use their reputation, balance sheet and off balance sheet items rather than their very limited funds to act as counterparts. In fact of all forms of private enterprises, financial institutions are some of the most highly leveraged firms considering their equity to obligations to their depositors (ibid).

The emphasis on viewing financial intermediaries as value-creating economic units that deal with risk management is critical to this study. Banks are the most probable source of finance for

enterprises in Zimbabwe, even if they may not have local and foreign currency savings to lend. They theoretically are able to leverage international correspondent bank relationships (in the case of local banks) and affiliates or parent banks (in the case of foreign owned banks) to negotiate for foreign lines, as they carry out their fundamental activity of risk transformation and risk management. They are supposed to know the Zimbabwe risk and the pharmaceutical manufacturing risk better than the offshore providers of capital and can therefore intermediate not only in the local economy but can be integrated with global financial systems to channel capital to technological capability upgrading and innovation in the local pharmaceutical industry. This in-depth analysis of the theory of contemporary banking and financial intermediation is important as it forms the keystone on the role Zimbabwean banks can theoretically play in financing ARV drug manufacture, by acting as value-adding economic agents that manage risks and leverage their local knowledge of risk to intermediate foreign capital and local projects. The second reason for the detailed treatment of contemporary banking and financial intermediation was to surface the complexities involved in financial intermediation and the highly specialist skills required to advance loans, balancing the liquidity of a bank as it does maturity, liquidity and risk transformations whilst managing regulatory requirements. As argued in chapter 1, it is not just about getting money but there are technological capabilities at play involved in the financing of African local pharmaceutical manufacture.

3.6 Technological Capabilities Framework

In the previous section, I discussed contemporary banking and financial intermediation theory that explains what banks do and how they do it. Risk is at the core of the business of financial intermediaries, as economic units that add value to borrowers (Scholtens and van Wensveen, 2000, 2003). Contemporary banking and financial intermediation theory though is silent on the technical capabilities involved in financial intermediation, specifically for this study, the complexities, expertise and lending technologies surrounding lending. In as much as financial institutions do not deal with physical products because they are in the services industry, they still deal with products (intangible though they may be) and processes and therefore are subject to product and process

innovation. There is a dearth of literature on product and process innovation in African financial services, and I used Lall's technological capability framework to map out some similarities with the productive firm. For the pharmaceutical company as a productive firm I used Lall's (1992) firm level technological capability framework with a minor modification of adding project finance.

Lall (1992) explored the nature and determinants of micro level technological development and proposed a framework for national technological capabilities built on incentives, capabilities, and institutions. He suggested that firm level technological capabilities were made up of investment capabilities, production capabilities and linkage capabilities (ibid). He defined investment capabilities as "the skills needed to identify, prepare, obtain technology for, design, construct, equip, staff and commission a new facility (or expansion)" (Lall, 1992:168). Production capabilities are "range from basic skills such as quality control, operation, and maintenance to more advanced ones such as adaptation, improvement or equipment stretching to the most demanding ones of research, design and innovation" (Lall, 1992:168). Lastly, linkage capabilities are "the skills needed to transmit information, skills and technology to, and receive them from, component or raw material suppliers, subcontractors, consultants, service firms, and technology institutions" (Lall, 1992:168).

Kim (1997) defined technological capability as "the ability to utilise technological knowledge in the absorption, adaptation and remodelling of contemporary technologies". It is important to point out that technology can be the hardware as embodied in capital equipment for production and processing (Kumar *et al.,* 1999). Or technology can have a software aspect as in tacit knowledge and the recipes for making or processing a product or service (ibid). Kumar *et al.,* (1999) describe the two components of technology as "(a) the physical component which comprises products, tooling, equipment, blueprints, techniques and processes and (b) the informational component made up of know-how encompassing management, production, quality control, skilled labour and functional areas". My discussion of technological capability refers to both the hard and soft aspects of technology.

Technological capability can be viewed as the process of technical knowledge absorption, adaptation and modification through learning (Kumar *et al.*, 1999). The various vehicles of transfer are foreign direct investment, joint ventures, acquisition of capital goods, and franchising (ibid). Kumar *et al.*, (1999) built the core of their conceptual model of technological capability on Lall's (1992) firm level technological capability framework. In developing country contexts where foreign direct investment and joint ventures are limited, two feasible options for technological capability upgrading are long term loans to acquire capital equipment and secondly franchising for the transfer of both hard and soft technological capability. This brings to the fore the importance of knowledge and learning by doing involving both codified and tacit (body contact) knowledge (Lundvall, 2007) particularly that relating to the finance sector.

Lall (1992) argued for state intervention in bolstering technological and industrial development at a time when the tide was against industrial policy or any state intervention but in favour of non-interventionism in development circles. He argued that discourses then assumed that developing countries obtained all technological improvements from developed countries and transfer of technology was seamless with no need for adaptation in developing countries (ibid). Based on this he argued for selective interventions other than the functional governmental support which was in vogue (ibid). I discuss this in detail in the next section.

3.6.1 Firm level technological capabilities

Lall (1992) splits technological capabilities into national level technological capabilities (NTC) and firm level technological capabilities (FTC). Firm level technological capabilities include investment (pre-investment and project execution), process engineering, product engineering, industrial engineering, and linkages within the economy (see Fig 7; the blue section). His firm

level technological capability matrix was based on earlier work on micro level technological trajectory analysis by other authors (ibid).

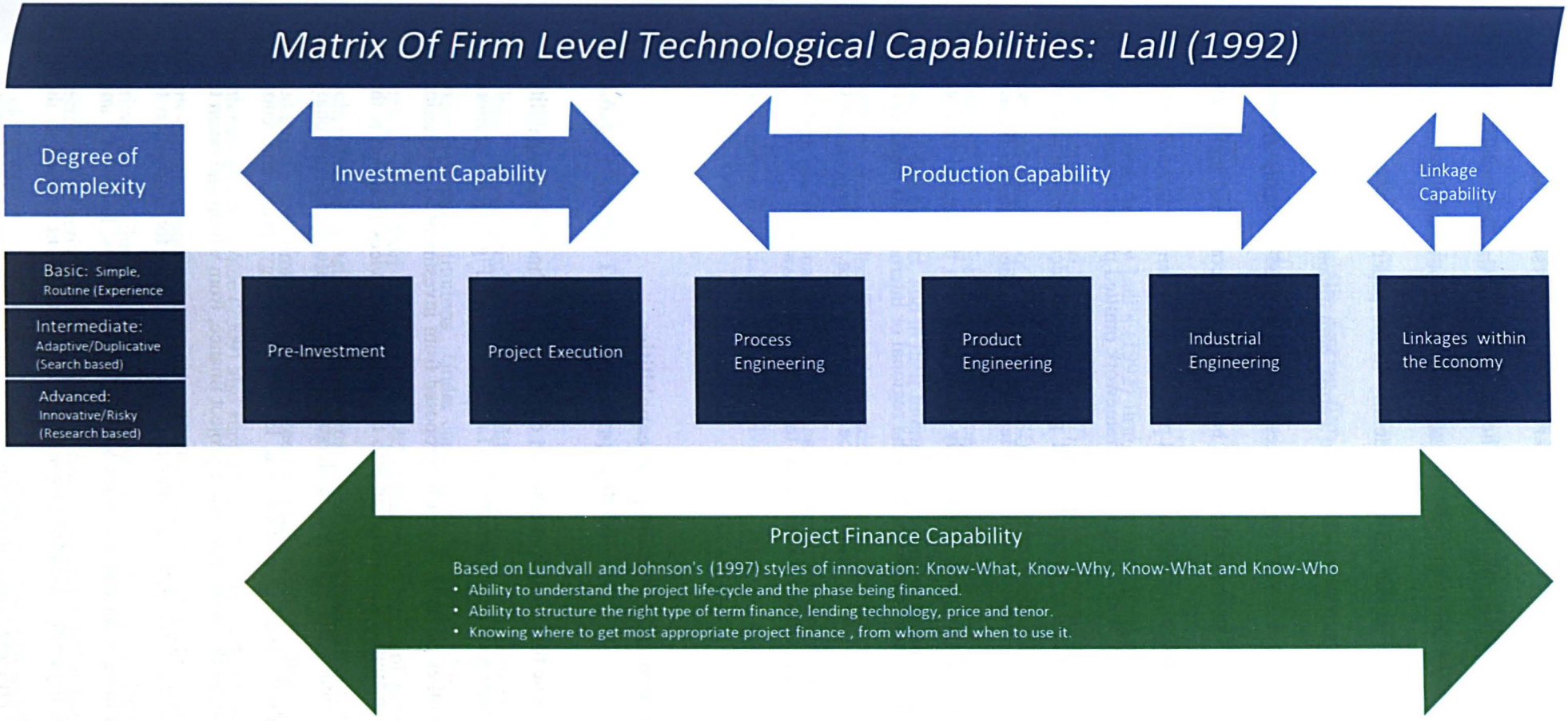
The stylised facts presented by Lall (1992) are that firms do not possess equal capabilities and aptitudes for technological knowledge, and consequently technological imitation and/or transfer between firms is unequal. He argued that the process of technology transfer inevitably involved knowledge and learning as aspects of technologies that are tacit, reflecting Polanyi's (1966) we know more than we can tell thesis (ibid). As a result, attaining expertise in a certain technology is not a passive process but involves effort and investment by the firm. Lall (1992) asserted that technological change is a continuous process driven by inputs external to the firm as well as past knowledge (institutional memory).

In categorising his firm level technological capabilities, he drew upon the work of Dahlman, Ross-Larson and Westphal (1987), his work; Lall (1987) and Kats (1984, 1987) to synthesise what he called an indicative technological capability framework (see abridged version in Fig 7 the blue coloured portion). The key firm level technological capabilities were; investment split into pre-investment and project execution; production capabilities of process engineering, product engineering, industrial engineering, and finally linkages within the economy (Lall, 1992). At each level he described the degree of complexity ranging from basic (experience based) to intermediate (search based) to innovative or risky activities (research based).

Investment capabilities covered skills relevant in searching for, identifying, making preparations, and acquisition of technology. This may involve construction, equipping, staffing, and commissioning a green field operation or growth of an existing plant. Factors under consideration at this stage include capital investment, technology, product range, mix and appropriateness of hard and soft technologies (ibid).

Under production capabilities, he included the usual production functions of quality assurance, operations, machinery stretching, and adaptation which involve product and process engineering (ibid). These skills are critical to technological effort depending on in-house aptitude for adoption, adaptation, and modification of technology (ibid). Lastly he discussed linkages within the economy, which depended on skills critical for effective communication of skills and technology between, amongst to and from suppliers, sub-contractors, other firms, technology institutions, and other service firms (ibid). These extra market linkages are key to increasing productive capacity and efficiency, however he pointed out that all these factors were subject to macroeconomic environmental factors, competition and trade policy regimes (ibid).

This discussion reveals that the framework was built more for the manufacturing sector than the financial services sector. However, when consideration is made to the fact that financial institutions sell products, intangible though they may be; it implies that product and process engineering goes on in financial institutions. The nature of the product being dealt with is intangible and knowledge intensive, and the technology used is both hard and soft. On that basis, I argue that it may be possible to use the technological capability framework to understand some processes in banks.



Source: Modification of Lall's (1992) matrix of technological capability and Ernst and Lundvall's (1997) styles of innovation. Green section is author's modification.

Figure 7: Modification of Lall's (1992) matrix of technological capability to include project finance capability

Lall's (1992) spoke of the need for the ability to garner financial resources and physical investments as being critical to technological capability upgrading. However, he did not pursue the issue of efficient financial systems and ability to garner financial resources and physical investment further for developing country contexts (ibid). This is the gap that I identify in his paper, because African financial systems are anything but efficient and the ability to garner both financial resources and physical investment for technological capability are the greatest challenge faced by many African countries (see sections 2.3, 2.6 and 2.7). Consequently on the basis of African countries' inefficient financial systems and inability to garner financial resources and physical investment for technological capability upgrading, I argue that Lall (1992) in his indicative framework omitted project finance as a key capability to access financial resources to import capital goods (the physical embodiment of technology). As discussed in chapter 2, many African countries do not have the capital to finance acquisition of plant, equipment and machinery and have to rely on regions with the capital through regional banks. Accessing these foreign long term loans from the regional or international banks calls for skills and expertise in synthesising a robust project finance document hence the importance of project finance for garnering the resources critical for importing technology (hardware).

3.6.2 Modifying Lall's (1992) firm level technological capabilities.

Based on the observation above, I argue that there is another set of firm level technological capability of project finance relevant for developing country contexts that Lall omitted (see Fig 7; green portion) which incidentally pervades all the other capabilities that he proposed from investment to production and linkage capabilities in both the manufacturing firm but also the financial services firm that is the bank. Project finance capability entails the ability to understand a project life cycle, the phase financed, and the ability to structure the right type of finance, lending technology, price, and tenor. This also includes knowing where to get the most appropriate project finance, from whom and when to use it based on Ernst and Lundvall's (1997) styles of innovation that argue that for innovation to occur, there is a need for a system integration that leverages know-what, know-how, know-why and know-who. Lall (1992) may have implicitly included project finance in investment as well as the national technological capability of efficient financial systems (banks). However, I argue that project

finance is so important for developing country contexts that it warrants a separate classification where financial systems are not efficient and growth of capital-intensive enterprises depends on capital investment financing (long term foreign loans) in most cases from offshore sources (see sections 6.2.3, 8.2). Secondly, project finance crosses over firm level and national level actors. It is therefore a key technological capability linking firm level and national level capabilities with respect to financing technological capability upgrading.

I therefore modify Lall's (1992) firm level technological capabilities matrix and add project finance based on Ernst and Lundvall's (1997) style of innovation (see Fig 7). The pivotal issue then becomes national systems of innovation (NSI) and technological capability in a learning national economy (Adeoti, 2002). Freeman (1987) broadly defines NSI as a network of institutions; be they private or private that interact, and in their interaction stimulate, cause the adoption, adaptation, and diffusion of technologies. Project finance becomes an issue in NSI because by its very nature it involves a network of firm and national level private and public institutions such as technology institutions, training institutions, financial institutions, universities, firm level training.

3.6.3 National Technological capabilities

Under national technological capabilities Lall (1992) discussed three key factors; capabilities, incentives and institutions. Under capabilities, he discussed physical investment, human capital and technological effort (ibid). Lall (1992) touched on issues of government support through industrial policy favouring selective support instead of functional support that called for getting prices right, reduction, or elimination of protection and assumed free flows of capital and technology internationally. Wade (2009) also supported a state-led development approach, where governments of low-income countries pay greater attention to industrial policy than aid donors and prior governments driven by neo-liberalism had done in the last 25 years. Wade (2009) defined Industrial Policy as "any sectorally or activity targeted interventions", and argued that the perception of industrial policy as picking winners must be discarded, as "industrial policy can be done 'big' or 'small' and by leading

the market or following the market". This is done by taking advantage of endowments and constantly directing industry to upgrade or diversify and in some cases encouraging linkages (ibid). An extension of the industrial policy argument as argued by Wade (2009) involves a coordinated nationally driven effort to inculcate technological capability upgrading (see also Lall, 1992).

Under incentives, Lall (1992) covered macroeconomic incentives, incentives from competition and incentives from factor markets. Interest rates, exchange rates, credit availability and foreign exchange availability are key drivers of macroeconomic incentives (Lall, 1992) and incidentally all these factors fall under exchange and monetary policy which are linked to fiscal policies. He also alluded to political stability as a key macroeconomic incentive constituent, however for Zimbabwe these incentives have turned more into disincentives for industry (see chapter 5, 6 and 7). Lall (1992) however did not give a comprehensive discussion of institutions save to mention that institutions key for technological capability include the legal framework, property rights, and industrial institutions that promote firm inter-linkages, technology and training institutions and support for smaller enterprises.

I used Lall's (1992) national level technological capability framework to I look at the business and environmental factors that made doing business in Zimbabwe a difficult task emanating from policy and practice gridlocks (see chapter 7).

3.7 Conclusion

In this chapter, I set out to build the theoretical framework to understand the complexities surrounding financing of ARV manufacture in Zimbabwe. I pointed out that looking at any of these theories; trade credit theory, pecking order theory, financial intermediation theory or economic, social, and financial history literature in isolation could not adequately explain the complexities surrounding financing ARV manufacture in Zimbabwe. Since this study is at the interface of finance and innovation, I added Lall's (1992) technological capability framework to the above literature to come up with an eclectic

theoretical framework to understand the financing of ARV manufacture in Zimbabwe. Economic, social, and financial history revealed internal finance was used to set up enterprises and retained earnings were used for enterprise growth. Banks, however were the most prominent source of external finance and had played a critical role in financing industrialisation. Financial intermediation theory unravelled what banks do and how they do it. Trade credit was shown to be another external source of in-kind finance from suppliers. To bring in the innovation aspect of the study, I discussed Lall's (1992) technological capability framework and I argued that Lall omitted project finance by assuming efficient financial systems for garnering financial resources and physical investment, which is not the case in Zimbabwe or many other African countries.

Chapter 4: Methodology: Navigating Access, Data Collection and Analysis

In Chapter 1, I introduced the study arguing that the complexities surrounding financing African local pharmaceutical manufacture have been ignored in contemporary discourses on local pharmaceutical manufacture, especially the technological capabilities at pharmaceutical companies and lending technologies, expertise and politics of lending at banks. In chapter 2, I discussed African financial systems and pharmaceutical manufacturing, and also discussed what local pharmaceutical manufacture is all about. I gave a background to Zimbabwe's political economy, the rise of manufacturing, Zimbabwean financial systems, the pharmaceutical industry and the story of ARV manufacture. In chapter 3, I constructed the theoretical framework for the study. In this chapter, I link the previous three chapters and the succeeding five chapters by discussing the research design, the mixed methods research paradigm taken, data collection methods, data analysis and the challenges I faced in carrying out the study.

In the next section, I discuss the multidisciplinary nature of the study and how I coped with the challenges of the many threads of enquiries and evidence that I could have included in this study.

4.0 Introduction

In 1979, as a ten-year-old boy, we moved house from a relatively simple set up of the brickfields compounds in Mt Hampden, on the outskirts of Harare to a more populated and "more sophisticated" township; Dzivarasekwa about 10 kilometres from the city centre of Harare. The move from the single-class-per-grade Alpha Brick Primary School to the four-class-per-grade urban township Gombo Primary School was an eye opening and paradigm shifting experience.

At break time on my first day at the new school, I looked for a friend. I asked his sister where he was and she pointed me to the soccer field. When I turned to the soccer field what met my unaccustomed

and "unsophisticated" eyes was a mesmerizing site. There were multiple tennis balls and other colourful plastic inflated balls whizzing past and criss-crossing each other, as boys of different grades ran in all directions (rather madly to me at that time), all playing soccer at the same time on the same field. What crossed my mind was how could these boys make sense of all this mayhem and madness? I later learnt, after becoming "street-wise", that many sets of teams could play soccer at the same time, on the same soccer field. The key to playing soccer in this environment was; first know who your team members are, second know which team is your opponent and third and most importantly keep your eyes on your ball (whatever form or size it was) at all times. With time, I learnt to ignore or push into the background the other teams and their balls, and made sure, I avoided colliding with the bigger, senior boys. In the end, the novelty wore off and I became a regular, but not-so-good soccer player in the mayhem and madness at break time in primary school.

Fast forward to 2010; for a person schooled in the research methodology paradigm of the natural sciences and who made a mid-career change to banking and financing enterprises for seven years; embarking on PhD studies in Policy, Practice, and Development Studies required a paradigm shift similar to my primary school experience. Studying the financing of local pharmaceutical manufacture of ARVs in Zimbabwe and the complexities and technological capabilities surrounding it, was also reminiscent of my move to a new primary school. As I discussed in chapter 3, building an eclectic theoretical framework using economic, social and financial history literature, financial intermediation theory, trade credit theory, pecking order and Lall's (1992) technological capability framework to research financing of ARV manufacture in Zimbabwe, a country emerging from hyperinflation, presented a plethora of issues to consider. I had to learn to keep my eye on the ball of financing and its attendant complexities at all times, at the same time cognisant of the fact that finance is part of an integrated system for technological capability upgrading in pharmaceutical companies.

I learnt a new and unfamiliar language of epistemology, ontology and axiology. Lincoln and Gruba (1985) define epistemology as the science of knowledge, and the relationship between the knower and the known. Positivists believe that the knower and the known are independent, whereas naturalists

believe the knower and the known are inseparable (ibid). Ontology is the nature of reality with a dichotomy in perception between positivists and naturalists (ibid). The former argue that there is a single reality and the later advocate for multiple realities. This debate was traced by Johnson *et al.*, (2007) to the early philosophers Socrates and Plato whose singular truth approach to viewing the world is in contrast to the Sophists (such as Protagoras and Gorgias) who favoured multiple or relative truths. Axiology covers the role of values in enquiry; positivists believe that enquiry is value free whilst naturalists argue that enquiry cannot be value free (Tashakkori and Teddlie, 1998).

Understanding the concepts described above helped in keeping focus on the study. My ball of interest involved using a finance lens to understand the lending technologies, expertise, complexities and technological capabilities involved in financing ARV manufacture and the link between finance and innovation. I used Lall's (1992) technological capabilities matrix to link investment at firm level in the pharmaceutical company and the financiers. As I argued in chapters 1, 2 and 3, it is not just about getting money. Financing technological capability upgrading and innovation of the local pharmaceutical industry is surrounded by complexities at the pharmaceutical company and at banks. As a banker, I was acutely aware that finance is part of a bigger and integrated system in local African pharmaceutical manufacturing which involves technology, technology transfer and human capital amongst many other factors that contemporary discourse cover.

Although the Zimbabwean economic situation is uncharacteristic of other African countries, it provides an accelerated theoretical and empirical window to analyse and understand how many things can go wrong at the same time and what rebuilding an industry for a developing country emerging from an economic collapse entails. In this sense, Zimbabwe can serve as a microcosm to precipitate challenges that developing countries can face in local manufacture of drugs. I am cognisant that Zimbabwe's industrial development trajectory and economic history is peculiar, (see chapter 2), but focus on Zimbabwe can yield lessons learnt for other developing countries.

4.1 Research Objectives and Scope

In this section, I discuss the link between the study, global health, access to medicines for African countries as well as emerging contemporary debates and initiatives to increase local pharmaceutical manufacture in Africa. I discuss the gap in knowledge and the complexity surrounding access to finance in a developing country context. I also discuss how my findings can contribute empirically and theoretically to knowledge.

4.1.1 What is the big story?

The big story that this thesis contributes to is local pharmaceutical manufacturing, and access to medicines in Africa. There are renewed local manufacture thrusts with political backing spearheaded by the African Union (AU), New Partnership for Africa's Development (NEPAD), Southern African Development Community (SADC), and East African Community (EAC) (UNIDO, 2011b; EAC PMPOA, 2011). Pan-African institutions such as ANDI (African Network For Drugs and Diagnostics Innovation) among others are promoting innovation in drugs, diagnostics and vaccines innovation in Africa (ANDI 4th Stake Holders Conference, 2011; Nwaka *et al.*, 2012). The focus of these initiatives include technology transfer and institutional strengthening and capacitation, product and process innovation, vertical integration and drug regulation harmonisation (Nwaka *et al.*, 2012; Rovira, 2006; UNIDO, 2010a; 2011b). Examples of these efforts can be found in the UNIDO (2010a, 201b, 2011a, 2011b) reports of four African countries manufacturing capability scans (Kenya, Uganda, Zimbabwe and Nigeria).

Another example is the GIZ (Germany Development Agency)-EAC PMPOA (2011) five country pharmaceutical manufacturing capabilities scan of Rwanda, Burundi, Uganda, Kenya and Tanzania, and ANDI's 33 centres of excellence in Africa (ANDI 4th Stakeholders Conference, 2011; Nwaka *et al.*, 2012). ANDI centres of excellence are a pan-African initiative to harness fragmented innovation capabilities in Africa through centres of excellence from which other African regions can learn,

utilising Ernst and Lundvall's (1997) learning by doing approach to innovation. This thesis contributes from a theoretical and empirical basis to this big story of African local pharmaceutical manufacture, unravelling some complexities surrounding financing of ARV manufacture by focusing on the link between finance and innovation.

4.1.2 Where is the gap in knowledge?

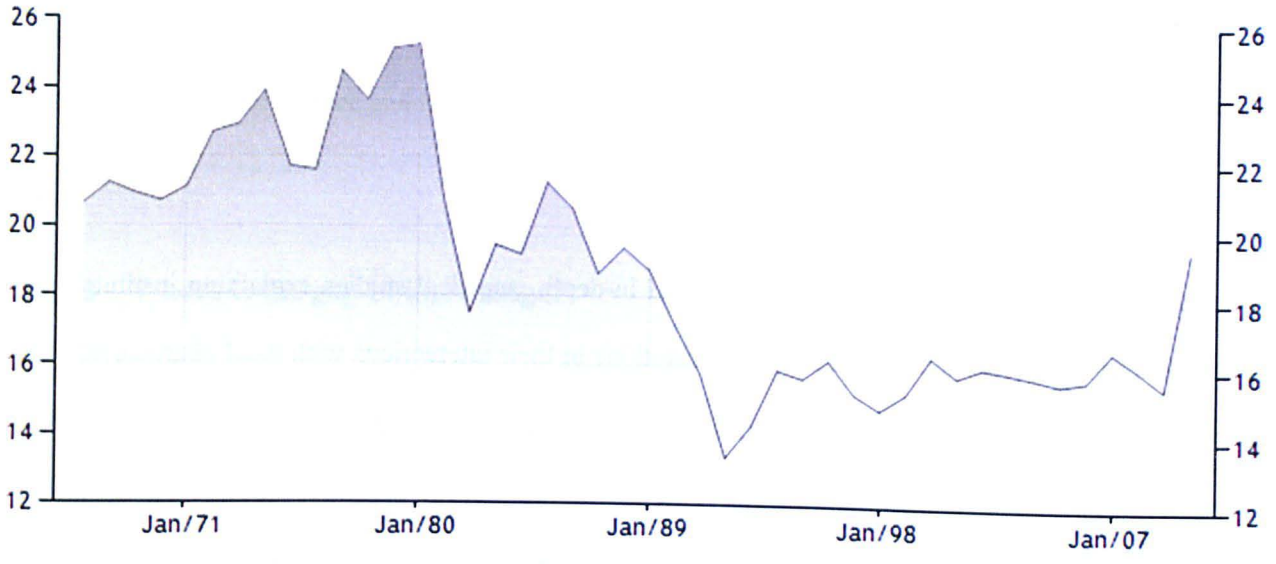
There is an empirical and theoretical gap in knowledge on financing local African pharmaceutical manufacture. Firstly, to the best of my knowledge, there has been no theoretical and empirical work on financing local pharmaceutical production in Africa and secondly no empirical work has been done to explain why local pharmaceutical financing by banks is subdued. The complex interaction between banks, or other financiers for that matter, and pharmaceutical companies and the requisite firm level technological capabilities of project finance necessary to successfully seek project finance and advance project finance loans by financiers are assumed to exist; another gap in knowledge. As argued earlier it is not just about money but the process is complex and needs a theoretical and empirical grounding (see section 1.2 and Fig 1).

There is a dearth of focus on financing local pharmaceutical manufacture in African innovation, industrial development, enterprise finance, and technological capability literature. Literature that discusses local pharmaceutical manufacturing in Africa focuses on technology, technological capability, technology transfer, human capability and economies of scale (Anderson, 2010; Bates, 2008; Kaplan and Laing, 2005, Rovira, 2006; UNCTAD, 2011; UNIDO 2010a, 2010b, 2011a, 2011b; Wilson *et al.*, 2012). The issue of finance is mentioned in passing as a major hurdle for African pharmaceutical manufacturing and technological capability upgrading, especially the scarcity of long term loans (Anderson, 2010; Bates, 2008; Kaplan and Laing, 2005, Rovira, 2006; UNCTAD, 2011; UNIDO 2010a, 2010b, 2011a, 2011b; Wilson et al., 2012). Access to finance was identified by pharmaceutical companies in Africa as one of the major challenges to local drug manufacturing as evidenced in the UNIDO four-country scans and the GIZ-EAC East Africa five-country scans

(UNIDO 2007, 2010a, 2010b, 2011a, 2011b; EAC PMPOA, 2011; ANDI, 2011). There is acknowledgement that finance is a hurdle, but in many instances, the discussions are scant and usually the subject is exhausted in a paragraph or two. I argue that there is more to financing local pharmaceutical manufacture than contemporary literature discusses.

The gap in knowledge, is a lack of theorising and in-depth empirical studies explaining institutional behaviours (politics of lending) of financial institutions in their interactions with local pharmaceutical companies when assessing projects for credit risk and when deciding to lend or carry out transactional banking (see chapters 6, 8 and 9). This is important as it provides some basis for discussion on who will finance African pharmaceutical companies' technological capability upgrading and innovation. This study intends to enrich discussions on sources of finance, why those sources of finance and most importantly whether African countries have financial systems that can finance African pharmaceutical industry technological capabilities upgrading that fosters innovation take-off. In most sub-Saharan African countries the accumulation process (national savings as a percentage of GDP) are depressed signifying low potential of using local sources of capital to finance pharmaceutical industrialisation (see Fig 8; chapters 2,3, 6 and 8). External finance in the form of bank debt (foreign currency offshore lines of credit) or FDI seem the most viable source of external finance for acquisition of plant equipment and machinery (chapter 2 and 3). However, FDI and offshore loans are highly linked to ease of doing business, country competitiveness, which are driven by macroeconomic and political stability. This rules out a significant number of African countries in accessing these financial resources for importing plant, equipment and machinery.

Financial intermediation literature on Africa as discussed in chapter 2 covers traditional banking aspects on lending and costs, but do not cover the politics behind lending, and the dynamic interaction between banks and pharmaceutical companies. This thesis contributes to this gap in knowledge. The traditional moral hazard and adverse selection explanations for low lending in Africa do not tell the complete story. The politics of lending explanation enriches discourses on why African banks, lend little, at high interest rates and high interest spreads to African enterprises.



Source: http://www.tradingeconomics.com/sub-saharan-africa/gross-domestic-savings-percent-of-gdp-wb-data.html accessed 13 May 2012.

Figure 8: Gross domestic savings as a percentage of GDP in Sub-Saharan Africa (1966 – 2012).

I acknowledge that finance is not the panacea. Finance is important but not sufficient for successful local manufacture of drugs and ultimately technological capability upgrading and innovation take-off. However, because of the neglect to date in contemporary discourses, I focus on this gap and contribute theoretically and empirically to enrich contemporary discourses on local pharmaceutical manufacture. Fig 9 below graphically shows the processes I am focusing in the financing of ARV manufacture to bring out the gaps mentioned above. At the pharmaceutical firm level, I am focusing on who finances working capital and capital investment for research and development, and manufacturing. My interest is on who finances, how they finance and the technological capabilities involved in accessing working capital and capital investment finance.

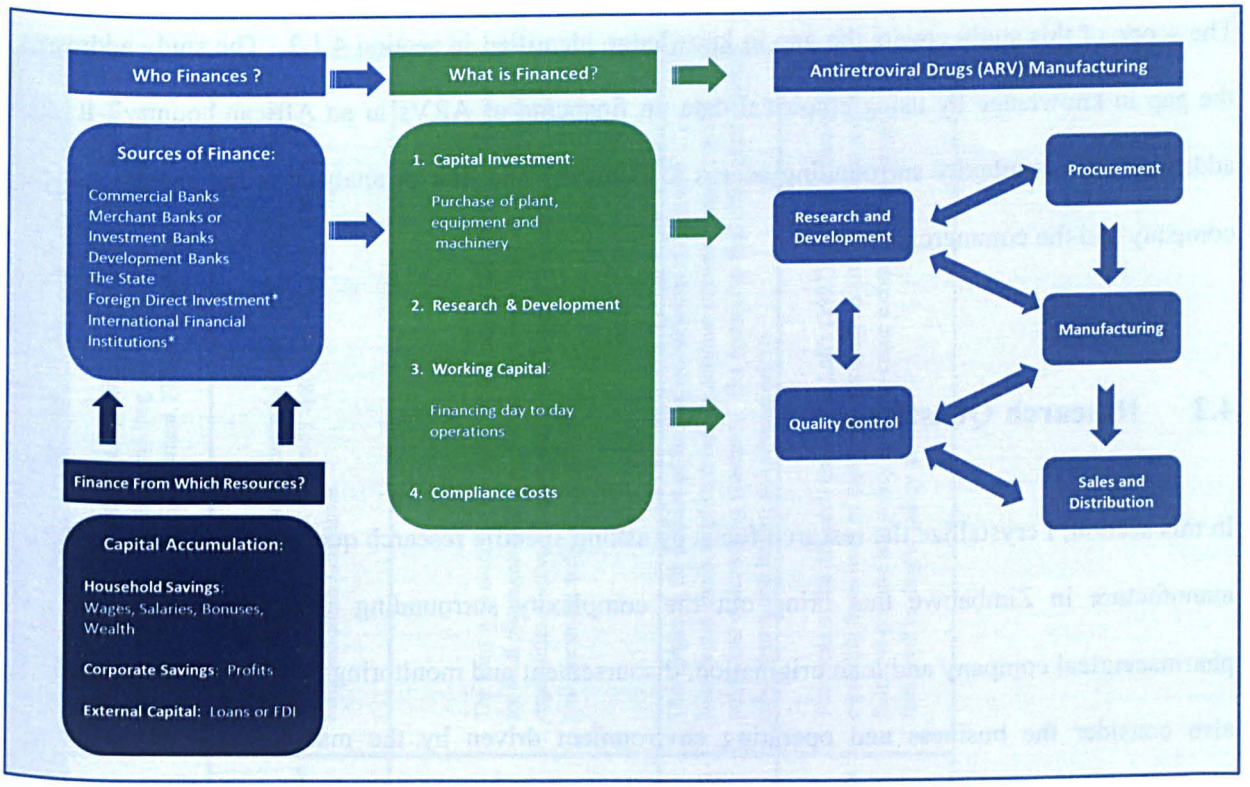


Figure 9: A summarised graphical representation of the focus of this study.

4.1.3 Scope of the study

The focus of this study is uncovering complexities surrounding financing of local ARV manufacture in Zimbabwe. As argued in chapters 1 and 3, it is not only about money, but there are firm level technological capabilities for pharmaceutical companies and expertise and lending technologies for banks that determine access to finance.

I therefore focus on technological capabilities of investment and project finance critical for accessing finance by pharmaceutical companies (see chapters 5 and 7). With regard to banks, I focus on lending technologies, know-how and expertise that influence the magnitude of lending to pharmaceutical companies (see chapter 6). I also focus on the politics of lending in light of institutional behavioural characteristics driven by credit policies, underwriting standards, credit risk analysis, credit risk management, and revenue streams strategies. These institutional behaviours are driven by bank ownership and pharmaceutical company ownership (see chapter 6 and 8). I also focus on the markets for drugs (the demand-pull factor) and how public health drug procurement can or cannot be used as an industrial development policy tool (see chapter 6).

The scope of this study covers the gap in knowledge identified in section 4.1.2. The study addresses the gap in knowledge by using empirical data on financing of ARVs in an African country. It also addresses the complexity surrounding access to finance. The unit of analysis is the pharmaceutical company and the commercial bank.

4.2 Research Questions

In this section, I crystallize the research focus by asking specific research questions on financing ARV manufacture in Zimbabwe that bring out the complexity surrounding access to finance for the pharmaceutical company and loan origination, disbursement and monitoring and control at the bank. I also consider the business and operating environment driven by the macroeconomics and other national technological capabilities.

4.2.1 Main research question

The overarching research question is: **How is local manufacture of ARVs in Zimbabwe financed and what are the complexities and technological capabilities surrounding this financing?**

I break down the main research question into five specific sub-research questions to bring out the complexity surrounding financing of ARV manufacture in Zimbabwe below (see Table 14):

1. How are capital investment and working capital requirements for ARV manufacture financed?
2. As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?
3. At firm level, what technological capabilities are required for pharmaceutical companies to access finance and the expertise and capabilities at banks required for loan origination?
4. What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?
5. What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?

Table 14: ***The main research question, sub-research questions, areas of focus and analysis.***

Main-Research Question	Sub-Research Question	Focus Areas and Explanation
How is local manufacture of ARVs in Zimbabwe financed and what are the complexities and technological capabilities surrounding this financing?	1. How are capital investment and working capital requirements for ARV manufacture financed?	Sources of funds: Whether internal or external (bank debt) at the various categories of short, medium and long term. Did any funds come from Financial Institutions, Government, FDI, or Shareholders?
	2. As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?	This interrogates whether commercial banks play a significant role in financing technological capability upgrading and innovation for ARV manufacture in Zimbabwe.
	3. At firm level, what technological capabilities are required for pharmaceutical companies to access finance and the expertise and capabilities at banks required for loan origination?	The aims is to elucidate the complexities surrounding access to finance for local pharmaceutical manufacture. For banks this involves looking at capabilities involved throughout the processes of loan origination, credit risk assesment and credit manageme
	4. What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?	This speaks to the politics of lending embodied in institutional behavioural characteristics driven by revenue streams strategy, credit policy and underwriting standards. The focus is to find other explanations other than moral hazard and adverse selecti
	5. What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?	The focus of this research question is Lall's (1992) national technological capability framework of capabilities, incentives and institutions and how failure at practise and policy level can cause a compensatory reaction at firm level leading to policy an

4.3 Research Context and Genesis of the Study

The genesis of this study has roots in very close encounters with family, friends, relatives and colleagues affected by HIV/AIDS who could not access ARVs from both cost and availability perspectives during the 2000 - 2010 decade in Zimbabwe. If management of HIV/AIDS was such a critical issue and high on the agenda of the Government of Zimbabwe, NGOs, Ministry of Health, National Aids Council and Company Social Responsibility programmes why was the local supply of ARVs not expanding? Especially so, for a country once touted as the next newly industrialising country in the same breath with South Korea, and Singapore (Mlambo *et al.*, 2000, Phimister, 2000; Stoneman, 1990). The same country had a financial system heralded as one of the most advanced in Africa and a pharmaceutical industry established as far back as 1953 (Dailami and Walton, 1989; UNIDO, 2011b).

I recalled that during my banking days with an international bank, we did not consider the local pharmaceutical companies attractive credit prospects or as a significant investment opportunity, except for one company, later de-emphasised because of what were deemed to be management issues (see chapter 5). We classified the rest of the pharmaceutical companies as small to medium enterprises; but in essence, they were too big to be small to medium enterprises and too small to be large corporates. With this background in mind, I set out to understand how working capital and capital investment for manufacturing ARVs is financed in Zimbabwe. I was interested in the projected trajectory for the sector in its quest for technological capability upgrading, productive capacity expansion and industrial development.

This study is cross-disciplinary, straddling finance (banking), and innovation (technological capability upgrading), and draws literature from economic, social, and financial history, trade credit, financial intermediation, and technological capability. This eclectic collection of literature reflects the complexity and richness of studying financing of local ARV manufacture in Zimbabwe using a finance lens within an innovation context.

4.3.1 Cross-functional study after a hyperinflationary environment and economic collapse

Studying the financing of ARV manufacture in Zimbabwe from 2003 to date was always likely to carry risks, chief of which is the difficulty of teasing out the contagion and overextended effect of the economic collapse and hyperinflationary environment that prevailed. The economic collapse and hyperinflation pose challenges in clearly dissecting influences and directly attributing causative factors. These peculiar economic events had a huge impact on pharmaceutical manufacturing and manufacturing at large in Zimbabwe. Teasing out how these factors interacted to influence finance and credit availability can be a daunting task, and clearly distinguishing the different actors becomes difficult as any factor could be attributed to the vagaries of hyperinflation and economic collapse. I do not carry out a review of the hyperinflationary environment and its effect on the economy. Ndlela (2011) gives a detailed discussion of the economic events and hyperinflation in Zimbabwe; Evolution of Zimbabwe's economic tragedy: a chronological review of macroeconomic policies and transition to the economic crisis, and; Macroeconomic policies and transition to the economic crisis in Zimbabwe. Other authors who studied the same era of hyperinflation and economic collapse include amongst others Kairiza (2009), and Coomer and Gstraunthaler (2011). The purpose of this study was not to study the hyperinflationary environment.

What makes a study of this nature more challenging is the fact that it straddles two industries; pharmaceutical manufacturing and commercial banking, each of which faced its own peculiar business and operating challenges during this economic phase. Banks had to deal with cash shortages, a currency whose value was eroding fast daily as lending in Zimbabwe dollars became meaningless. As a result, I do not focus on Zimbabwe dollar lending in this study, as analysing that is not useful. The pharmaceutical companies for some time were constrained by law to deal in the local currency which was losing value daily, whilst importing active pharmaceutical ingredients using foreign currency, which forced some of them to mothball certain operations. Notwithstanding all these challenges, the story of how working capital requirements and capital investment financing for ARV manufacture in Zimbabwe is of historic, policy and academic

interest. Studies of this nature can assist in building an understanding of the context, breadth, and depth of challenges that a country emerging from hyperinflation and economic collapse faces in its quest to industrialise or re-industrialise as in the case of Zimbabwe.

In this study I focused on finance, specifically working capital finance and capital investment; who financed; using which sources; at what cost and why (see chapters 5 and 6). I focused on firm level and national technological capabilities (Lall, 1992), at the pharmaceutical firm manifesting in project finance, investment, business and operating environment, policy terrain and infrastructure to understand financing of ARV manufacture (chapters 3, 5, 6 and 7). For the banks I focused on lending technologies, financial intermediation and the expertise involved in loan origination, disbursement and monitoring and control.

I turn now to how I designed the study in the next section.

4.4 Study Design

There are diverse ways of carrying out social science research including; case study, experiments, surveys, histories, and analysis of archival information. Each strategy has peculiar advantages and disadvantages depending on the following three conditions (Yin, 2003):

1. the type of research question,
2. the control the investigator has over actual behavioural events and,
3. focus on contemporary as opposed to historical phenomena.

In the next section I discuss why I chose the case study approach to study financing of ARV manufacture in Zimbabwe.

4.4.1 Case study

I chose the case study approach for this study because I intended to carry out an empirical enquiry, investigating a contemporary phenomenon within its real-life context, where the boundaries between phenomenon and context were not evident. This kind of research is best done using the case study approach (Yin, 2003). Stake (1995) asserts that a case study looks at the particularity and complexity of a single case, coming to understand its activity within important circumstances, by looking at the details of interaction within its contexts. Thus, the case study is more suited when considering *how* or *why* questions, when the investigator possesses little control over events, especially real life events of a contemporary phenomenon and wants to cover contextual conditions (Gray, 2004; Yin, 2003). I used the case study strategy to cover the logic of design, data collection techniques and data analysis as it benefited from the development of theoretical propositions (see chapter 3) to guide data collection and analysis. Yin (2003) splits the components of research design into the following five segments;

i. a study's questions,
ii. its propositions if any;
iii. units of analysis,
iv. the logic linking data to the propositions and,
v. criteria for interpreting the data.

In this study, I am answering the *how* and *why* questions, making the case study approach the most appropriate. The proposition on which this study is based is that lack of finance and the complexity surrounding accessing finance for working capital and capital investment are some of the key reasons why Zimbabwe's pharmaceutical manufacturing industry is not experiencing technological capability upgrading and innovation. This proposition helps in identifying where to start looking for relevant evidence (Yin, 2003). The case in this study is the pharmaceutical industry and commercial banking sector and the units of analysis are the pharmaceutical companies and the commercial banks, the most viable source of external finance for enterprise growth in Zimbabwe.

A case study in and of itself does not generate data, but is a framework and context within which data can be collected through interviews, participation, questionnaires, or combinations of all these (Bryman, 2004).

4.4.2 Mixed methods

I chose the mixed methods paradigm for gathering data. Johnson *et al.*, (2007) argue that mixed methods research is part of a trilogy of major research paradigms; qualitative research, quantitative research and mixed methods. Their definition of research paradigm is built on Kuhn's (1962, 1977) coining of the word paradigm. Johnson *et al.*, (2007) define a research paradigm as "a set of beliefs, values and assumptions that a community of researchers have in common regarding the nature and conduct of research". These beliefs include but are not limited to ontological, epistemological, axiological, and methodological beliefs (ibid).

The mixed methods approach allowed use of various data gathering methods, which included; semi-structured interviews, informal discussions, conference presentations and interactions with pharmaceutical professionals for primary data, and document reviews for secondary data. Both quantitative and qualitative data were collected giving a rich data set. The quantitative data pertained to loans advanced, cost of the loans (interest and management fees), manufacturing costs of ARVs and projections of optimal capital investment for the pharmaceutical sector. I also gathered quantitative data on time scales involved in importing raw materials and spare parts, and credit terms advanced to customers by the pharmaceutical sector. Qualitative data was collected using the semi-structured and informal interviews. Qualitative and quantitative data complemented each other in building a deeper understanding of dynamics at play.

4.4.3 Sources of evidence

Yin (2003) lists six possible sources of evidence: documentation; archival records; interviews; direct observation; participant observation and physical artefacts. In this study, I used two main sources of evidence in various forms; interviews and documentation. I used semi-structured interviews, informal interviews and discussions. Amazingly, it was during chance meetings that tended to be short that I gained really insightful and useful information as follow-on to initial discussions. Some of the unusual places that I leveraged to gather data included chance meetings with Senior Executives at food outlets during lunch times. Immediately after these informal discussions, I documented the information in my field notebook. Other informal discussions and feedback were on the side lines at cocktail parties, workshops, and conferences in Zimbabwe, Ethiopia, Tanzania, and France, with key players in the pharmaceutical manufacturing industry, regulators, academics, and policy makers.

I held semi-structured interviews with key personnel in the pharmaceutical and commercial banking sectors and in a Zimbabwean Economic Think-Tank, drug procurement agencies and other organisations (see Tables 15 and 16 for a detailed description of key interviewees). I also used archival documents to collect background information and secondary data. Some sources of documents included: The World Bank (WB); International Finance Corporation (IFC); United Nations Industrial Development Organisation (UNIDO); United Nations Conference on Trade and Development (UNCTAD); GIZ; East African Community (EAC); Reserve Bank of Zimbabwe (RBZ); Ministry of Health and Child Welfare; Ministry of Finance; Ministry of Industry and International Trade; African Development Bank (AfDB); PTA Bank; and various NGOs. I also used various newspapers to collect published commercial banks' half year and fully year financial results.

It quickly became clear to me as I scanned published academic literature on manufacturing and the pharmaceutical sector in Zimbabwe that there was a dearth of data on financing local

pharmaceutical manufacture in accessible academic and grey literature. Literature for manufacturing only and not pharmaceutical manufacture dates back to the early 1980s and 1990s but as for current work; done in the 2000s, it was difficult to access except for a few books accessed from the British Library. Furthermore, published literature in journals on the pharmaceutical sector in general, and on financing local pharmaceutical manufacture in Zimbabwe or Africa is not available to the best of my knowledge. I relied on grey literature, accessing institutional publications from the African Development Bank (AfDB), the World Bank (WB), UNIDO, GIZ, UNCTAD, PTA Bank, Afreximbank, Reserve Bank of Zimbabwe, Confederation of Zimbabwe Industries (CZI) and other documents accessible on the web. The fact that data and literature specific to African pharmaceutical manufacturing and its financing was not available underscores the gap in knowledge identified in this study and the need for in-depth empirical data generation and analysis.

Academic literature on Zimbabwe's banks and the financial sector was also limited and covered the pre-1995 era with a bias towards mostly economic history and political economy. This lack of published academic literature on both the pharmaceutical and financial sector in Zimbabwe forced me to rely on my banking and manufacturing experience and practical knowledge of Zimbabwe. Unfortunately, during my career as a banker, I had neither managed nor advanced loans to the pharmaceutical sector, so there was no professional background to leverage except to scour grey literature, and relying on key personal contacts in the sector. The lack of professional experience in the pharmaceutical sector in a sense became an advantage as it freed me from issues of bias and insider status, which I had to deal with in the financial sector.

In addition to key publications on local production of medicines in Africa (UNIDO, 2007, 2010a, 2010b, 2011a, 2011b; Berger *et al.,* 2009; IFC, 2008; EAC PMPOCA, 2011), I used the snow balling effect to search for literature and other publications pertinent to this research cited in accessed literature. I also used Google scholar and electronic journals on the University's library website's flexibility of offering similar papers and who had cited the papers to search for relevant

literature using key words such as financing, industrialisation, local pharmaceutical manufacture in Africa, ARV manufacture, to mention just a few. I also accessed papers via referrals by academics and policy makers at workshops that I attended in Zimbabwe, Tanzania, Ethiopia, and France where I presented my work in progress.

4.5 The Conceptual Framework

As discussed in chapter 3, I built the conceptual framework from an eclectic collection of literature and theories from economic, social, and financial history, pecking order theory, trade credit theory, financial intermediation theory and Lall's (1992) technological capability framework. I discussed the framework in chapter 3. The justification was that use of a single body of literature was not sufficient to precipitate the depth and complexity surrounding financing of local pharmaceutical manufacture. It would miss the complex firm level technological capabilities of project finance at the pharmaceutical company, the politics of lending and project finance appraisal at the bank and the national technological capabilities of incentives, capabilities and institutions (Lall, 1992) that influence the business and operating environment and whose failure at policy and practice level can cause policy and practice gridlocks.

4.6 Research Process

In this section, I discuss sampling methods, data collection techniques for primary and secondary data and data analysis. As Stake (1995) asserts gathering data means going into someone's home turf raising issues of access such as; who you approach, how you approach them and how you collect the data.

4.6.1 Sampling and accessing the respondents

Because of the low and manageable number of pharmaceutical manufacturing companies and key commercial banks, I adopted the purposive sampling method. There are five main pharmaceutical manufacturing companies commanding up to 90% of local production and of these, I accessed three. There were seventeen commercial banks in Zimbabwe during my fieldwork and of these; I accessed nine of the major market-movers in terms of asset base, and influence, which was more than adequate, as these banks lent the most to the sector. For the pharmaceutical companies the downside to not accessing all the companies is not getting to understand why the two companies I could not access were not manufacturing ARVs. However, it became apparent as I spoke to the executives from the three other companies that they knew their market well and they allayed my fears that I did not miss much other than "hearing it from the horse's mouth".

4.6.2 Targeting the pharmaceutical companies

I leveraged my local knowledge of key contacts in the pharmaceutical industry, banking experience and the UNIDO pharmaceutical manufacturing scans to identify which companies to approach. The UNIDO (2007, 2011b) publications on Zimbabwe confirmed my local knowledge and helped give empirically based background information. I could therefore concentrate on the banking and technological capability nexus, which was at the heart of my research. Two pharmaceutical companies approached did not decline outright, however repeated efforts to gain access were met with silence; a polite "Zimbabwean" way of saying, "sorry I cannot help you, but I do not want to hurt your feelings".

I made initial contact with one of the pharmaceutical companies whilst I was still in Milton Keynes (UK). The initial response was positive, however after submitting the written proposals, emails went unanswered and contact phone numbers I had been given were no longer accessible. When I arrived in Zimbabwe, I arranged an appointment with the company Director through his secretary, who I had initially made contact with whilst in Milton Keynes and emailed a written proposal. The

meeting was postponed once, and when I arrived for the rescheduled meeting, I waited for almost one and half-hours. When he arrived, the director seemed interested and for the second time asked me to send a written application to him, which I did the same day. The response once again was silence. The negative experience was the same with the second company; a phone call to introduce myself, a request for a formal letter, emailing the letter and again silent treatment. A key contact had warned me that I was wasting my time trying to access those two companies, as I was unlikely to be granted access. The key contact had just completed a study on the local pharmaceutical manufacturing industry and could have been speaking from experience. This key contact helped with other companies as he introduced me to Executives, such that by the time I went for the interviews they all acknowledged that they had already been briefed about my research work and its importance.

The reception from the Chairman of the Pharmaceutical Manufacturers Association and MD of one pharmaceutical company was warm and professional right from the start. I had contacted him during my first year of study. Email and phone call exchanges culminated in a meeting and an endorsement of my study as he felt the study would be beneficial to the local pharmaceutical industry. This endorsement went a long way in my acceptance by the industry as a valid researcher.

I also learnt the dangers of unseen circumstances when arranging meetings during fieldwork. I had made headway during my first year of study to arrange for interviews with the key and only company that was manufacturing ARVs in Zimbabwe. However, after a long period of silence I decided to call and follow-up with the key contact at the company I had been communicating with and who had given some positive response. However, on following up, I learnt that the contact had left the company and I had to start afresh; and my request was met with a solid no. This was disheartening as it meant the whole project would flop. How could I tell the story of financing of ARV manufacture in Zimbabwe if the only company then manufacturing ARVs denied me access? Through serendipity, a family friend who is the Director of a Leadership and Management Academy asked me if I had spoken to the MD as he knew him in Professional circles. I explained

that I had tried to gain access and I was not being successful. He promised to call the MD, and by the following morning, I was given the contact number of the MD who literally opened the doors to all key departmental heads, and personally introduced me to some, asking them to hand me over to the next managers. As a result of the introductions from the MD, I gained the validation I needed to access key management, and this proved very useful. Consequently, I interviewed key executives and management. I also had a factory tour to see the types of capital equipment used and observe in situ the production process for ARVs in a WHO-prequalified plant. I made every effort to remain objective and not be captured.

4.6.3 Targeting the commercial banks, regional banks and other organisations

As mentioned earlier I purposively sampled commercial banks, accessing nine key commercial banks in Zimbabwe by asset size, market power and influence out of the registered 17 commercial banks. The access situation with the commercial banks was much easier than with the pharmaceutical sector. I leveraged personal contacts and industry experience to contact former colleagues in the financial services sector to set up interviews. As a result of this pool of former colleagues and industry contacts, I accessed senior management and executives in the commercial banks. Access to senior executives was critical as it gave me top management's view on the industry, their view of the pharmaceutical sector and the drivers of the politics of lending in banks. Senior management designs or influences the design of credit policy, underwriting standards and revenue stream strategies depending on bank ownership (international or local), which ultimately drives the politics of lending. A detailed list of the interviewees accessed is shown in Table 16.

As for access to the African regional banks, I was successful with one but not with the second regional bank, as I had no contact there. The representative asked for a written submission, to which they responded by sms and later by phone, informing me that they were unable to assist me locally. I had to contact their head office in Kenya if I wanted the data I was seeking. As a result, I did not access this regional bank but relied on accessing their annual reports via their website.

I used the strategy of referrals by friends and friends of friends to gain access to other organisations detailed in Table 17. However, the situation with an economic Think-Tank was different. I had come across their work through a local press report (The Herald) and on writing to them, the Secretariat was very welcoming and gave me the report they had produced on the pharmaceutical sector as well as other pertinent background documents on research done on the Zimbabwean economy. I took the opportunity to ask the Secretariat for an interview which was granted. The interview with the Secretariat was critical to understanding the business and operating environment, macroeconomic policies, as well as collaborative institutional connections this organisation had with labour, government, and industry in efforts to revive the economy looking at fiscal and monetary policies, trade policies, and industrial policies.

I also interacted with policy makers, pharmaceutical executives and regulators from East Africa, Southern Africa and other African countries through my participation at the ANDI fourth stakeholders' conference in Ethiopia, the East Africa Pharmaceutical Manufacturing Plan of Action in Arusha Tanzania and the AIDS conference in Zimbabwe (see Table 15 and 17). At the ANDI and East Africa conferences, I presented my work on financing local pharmaceutical companies and took the opportunity to find out the situation in East, West and other Southern Africa countries pertaining to local pharmaceuticals sector. Interaction with policymakers, pharmaceutical company executives and regulators from other African countries broadened my understanding of issues affecting financing of local pharmaceutical manufacturing in Africa.

Table 15: A breakdown of pharmaceutical industry respondents from Zimbabwe and the SADC region in 2011.

Pharmaceutical Companies Interviewees				
Company	Designation	Total Number of Interviews	Place of Interview	Country of Origin
1	Manging Director	1	Harare, Zimbabwe	Zimbabwe
	Research and Development Director	1		
	Research and Development And Regulatory Pharmacist			
	Procurement Manager	1		
	Production Manager	2		
	Sales and Marketing Manager	1		
2	Managing Director	1		
3	Maketing Director	1		
4	Consultant Pharmaceutical Industry	1		
5	Operations Manager	1		
6	Managing Director	1	Addis Ababa, Ethiopia	Ghana
7	Business Development Manager	1	Addis Ababa, Ethiopia	Uganda
8	Technical Manager	1	Addis Ababa, Ethiopia	Ethiopia
9	Managing Director	1	Arusha, Tanzania	Kenya
10	Chief Executive Officer	1	Arusha, Tanzania	Tanzania
11	Director Marketing	1	Arusha, Tanzania	Uganda
12	Executiver Director	1	Arusha, Tanzania	Kenya
13	Technical Director	1	Arusha, Tanzania	Tanzania
14	Senior Patent Examiner	1	Arusha, Tanzania	Kenya
15	Deputy Registrar	1	Arusha, Tanzania	Kenya
16	Legal Officer	1	Arusha, Tanzania	Kenya
17	Project Manager: Technology Transfer and Local ARV Production	1	Arusha, Tanzania	Tanzania
		22		

Table 16: A breakdown of respondents from the banking industry in Zimbabwe in 2011.

Financial Institutions Interviewees			
Bank	**Designation**	**Total Number of Interviews**	**Place of Interview**
1	Group Chief Executive	1	Harare, Zimbabwe
2	Executive Director Corporate Banking	1	
	Chief Risk Officer	1	
	Director Organisational Learning	1	
	Director Sales	1	
3	Managing Director Project Funding	1	
4	Executive Director Corporate Banking	1	
5	Executive Director Corporate Banking	1	
6	Head of Corporate Banking	1	
7	Head of Corporate Banking	1	
8	Head of Corporate Banking	1	
9	Senior Manager Corporate Banking	1	
10	Senior Relationship Manager	1	
11	Regional Manager Southern Africa	1	
12	Head of Business Development	1	
13	Director Pension Fund House	1	
		15	

Table 17: A breakdown of respondents from the NGO and other sectors in Zimbabwe and Africa.

Other Institutions Or Individual Interviewees			
Institution	Designation	Total Number of Interviews	Place of Interview
Academia	Director	1	Harare, Zimbabwe
Academia	Researcher in HIV Treatment	1	Harare, Zimbabwe
Economic Think Tank	Executive Secretary	1	Harare, Zimbabwe
NGO	Development Cooperation Manager	1	Harare, Zimbabwe
NGO	Public Health Specialist	1	Harare, Zimbabwe
NGO	HIV/AIDS Response And Monitoring and Control Practitioner	1	Harare, Zimbabwe
Accounting and Audit Board	Board Director	1	Harare, Zimbabwe
Accounting and Audit Board	Board Secretary	1	Harare, Zimbabwe
Independent	Independent Consultant on Pharmaceuticals	1	Addis Ababa, Ethiopia
Drug Regulatory Authority	Executive Secretary	1	Addis Ababa, Ethiopia
Development Agent	Regional Expert on Local Production of Pharmaceuticals	2	Addis Ababa, Ethiopia and Arusha Tanzania
Pharmaceutical Research and Development	Senior Lecture and Project Manager	1	Addis Ababa, Ethiopia
Pharmaceutical Company	Quality Assurance Head	1	Arusha, Tanzania
		14	

4.6.4 Data collection

I used two interview techniques; semi-structured interviews and informal conversational interviews as described by Gray (2004) who asserted that semi-structured interviews can be categorised as non-standardised and are often used in qualitative analysis, where the interviewer has a list of issues and questions to be covered. However, the interviewer may not deal with all of them and has the flexibility to change direction depending on the direction the interview may take (ibid). Informal conversational interviews on the other hand depend on spontaneous question generation and represent the most open-ended form of interviewing techniques (ibid). I used the semi-structured interview approach to gather data on operations of the pharmaceutical sector and commercial banking sector to unearth the politics of lending and technological capabilities involved in financing enterprises. I used the conversational interview type with key informants to explore banking and pharmaceutical technological capability dynamics. In many instances after the semi-structured interviews, when there was still time, I used the conversational type interview technique to gain an in-depth understanding of industry dynamics from senior executives and during the factory tour.

4.6.5 Accessing archived material before getting study visa.

My research work commenced before I came on campus at Milton Keynes in February 2010, because of complications in getting my study visa on time. The visa processing centre was moved from Harare and is now handled in Pretoria, South Africa. There was a delay in approval of the visa and it was more prudent to start collecting data whilst the second visa application was under process. I collected RBZ publications from the RBZ library and the budget blue books, which are the Ministry of Finance compilation of the budget presented in Parliament. I also made efforts to access the Central Statistics Office as well as The Ministry of Health and Child Welfare. I collected statistical information on health indicators and other pertinent documentary information some of which was printed material and the other on CDs. I took advantage to collect these books and publications as it would have been difficult to access them when in Milton Keynes.

4.6.6 Preliminary data collection in first year of study.

I also collected data in the first year as I developed the research question, devised the research design and prepared the probation report. I did this through telephone contact with key people in the pharmaceutical industry and commercial banks. One of the key contacts developed was UNIDO in Vienna, Austria. I came across their work in pharmaceutical manufacturing scans and promoting local manufacture. UNIDO informed me of their work on pharmaceutical sector profiles for Zimbabwe, Nigeria, Kenya, and Uganda. They later published and disseminated these publications in April-May 2011. The Zimbabwe document was the second UNIDO project following up on a 2007 document. I used information in the UNIDO (2007, 2011b) documents to pursue areas that needed clarity, which saved me time from gathering background data on the industry. Suffice to say both UNIDO documents, as well as those for other countries, although they mentioned access to finance as a key hurdle to growth, did not explore the complexity surrounding financing of local pharmaceutical manufacture and the role played by banks in financing technological capability upgrading; the gap I identified as the focus of this thesis.

4.6.7 First and second field trips to Zimbabwe

I carried the first fieldwork from March to May 2011. This served both as a pilot and first phase of fieldwork. There were rumours and insinuations of elections being held that year and I decided to play it safe to gather as much data as possible just in case it became difficult to access the field if and when elections were held. Elections are an unpredictable event and usually have the effect of making respondents nervous and I did not want to take this chance of leaving data collection for the second round. I collected primary data from three pharmaceutical companies and nine commercial banks, one regional bank, one local project finance company and one local pension house.

Building rapport as argued by Gray (2004) is important for establishing trust and respect between the interviewer and respondent. This process was much easier in the commercial banking sector, as

I knew many of the respondents as contemporaries in the market. At the beginning of each interview, aspects of informed consent, a brief background of who I was, the institution I was working with and the study I was conducting were explained to the respondents (see Appendix. Section 11). This was followed by asking respondents if they were comfortable with an audio recording of the interview. Of all the interviews held, except for the informal and introductory ones, only one respondent refused to be audio recorded. The estimated duration of the interview and the option for the respondent to opt out of the interview was explained to the respondents. Anonymity was promised to all the respondents that their names would not appear in the final report, and this has been observed.

In the next section I discuss data analysis.

4.6.8 Data analysis

Gray (2004) argues that there are two general strategies to analyse case study evidence namely based on the original theoretical propositions and research objectives emanating from them and the second strategy is to develop a descriptive framework on completion of the case study. The danger of the former approach however is lock-in and not seeing other new and relevant issues. Yin (2003) however recommends the former approach. Yin (2003) details five specific techniques for analysing case studies and these are; pattern matching, explanation building, time-series analysis, logic models and cross case synthesis. I carried out examination, tabulation, categorisation and testing of data using both quantitative and qualitative evidence as constituting data analysis (Yin, 2003). I tabulated the quantitative data on size of loans, costs of finance and other pertinent finance data concerned with financing of the pharmaceutical sector, to compare loans availed per company and the cost of those loans. I took advantage of analytic manipulations and presented the data as flowcharts, tables and photographs.

To understand the story behind the provision or lack of loans I relied on qualitative data, which was analysed using manual coding, categorizing and thematic analysis since the sample under analysis was manageable. The results came from semi-structured interviews where I grouped questions in different thematic categories as well as the conversational interviews. Richards (2005) argues that qualitative coding is about data retention, with the purpose of learning from the data by an iterative process of going back to the data until an understanding of the patterns and explanations fully emerge. The process leverages coding, to assist in getting past the mass of data to a category, and then working with the different data segments about the categories (ibid). There are various ways of coding including descriptive coding, topic coding and analytic coding (ibid). Analysis is an iterative and continuous process and the purpose of which is to give meaning to first impressions and the final write-up through taking findings apart (Stake, 1995). Braun and Clarke (2006) as well as Boyatzis (1998) define thematic analysis as a method for identifying, analysing and reporting themes or patterns within data by organising data and describing it in rich detail. They describe what counts as a theme as something important about the data in relation to the research question, representing some level of patterned response or meaning within the data set (ibid). I coded the data as described earlier in different thematic areas and carried out the continuous iterative process to build an understanding of the results (see chapters 5, 6 and 7).

In analysing the data I relied on theoretical propositions that led to the case study, the theoretical framework, research questions and the literature reviewed (Yin, 2003). I also made use of chronological events especially in analysing the effects of politico-economic events on national savings, financial architecture, incidence of lending technologies, technological capability loss through emigration and financial system architectural change, allocation of capital to industry and availability of term finance for technological capability upgrading.

I used the linear-analytic structure in writing up the case study, where I built up the study by establishing the theoretical framework, setting up the propositions followed by data collection, analysis, conclusions and implications from the findings in the discussion section (Yin, 2003).

4.7 Research Ethics

I followed Ruane's (2005) approach to research ethics that research should not cause harm to respondents, the researcher should obtain informed consent and researchers should respect respondents' privacy and avoid conflict of interest. In that regard, I obtained the Open University's ethical approval and observed confidentiality, and anonymity of the respondents. I informed the interviewees that they could withdraw from the research at any time. Before each interview, I sought permission to record the interview with an audio recorder. If the interviewee was uncomfortable then I did not use the audio recorder. Of all the respondents in the pharmaceutical and commercial banking sectors, only one Senior Banker refused to be recorded, and the audio recorder in that instance was not used, but I took notes during the interview.

4.8 Research Challenges

Investigating the past, present and future trajectory of the story of financing of ARV manufacture in Zimbabwe within an innovation context poses challenges of which lens or lenses to use in view of time and resource limitations characteristic of a PhD study. Using just a financial lens may tell a portion of the story, whilst using the policy, business management or industrial development lens would equally not shed light on a multidimensional story. Leaving out technological capability and policy lenses would mean a less rich account of the trajectory. As I discussed in chapter 3, I used economic, social, and financial history as well as innovation, finance, and financial intermediation literature to build a theoretical framework that would bring out a rich account of the complexity surrounding financing of local pharmaceutical manufacture of ARVs in Zimbabwe. I now turn to the specific field challenges I met.

One of the main challenges I faced was the bias factor; how does an investigator who used to be a practitioner in a certain field manage the bias effect? The fact is it is impossible to be totally objective when dealing with a field where one was trained professionally. What I tried to do to be

as objective as possible was to let the data speak for itself. I took care to use data obtained during the research. The advantage of practice, which may be a disadvantage from another perspective, is the ability to quickly and effortlessly assess key issues used by financiers to assess credit status and not be easily misled. However, practice could also straightjacket me into path dependence so that I could miss certain nuances that would be easier to note for an outsider. To circumvent this, I relied as much as I could on the primary data from the respondents minimising my own voice in the results. I however, leveraged my own experience in the analysis and description of the results, as is shown in the flow diagrams that I constructed using literature, respondents and my own practice experience to explain some of the technical banking aspects that qualify under the technological capabilities key for financial institutions. I also leveraged my practice experience and advantage as an insider who is now an outsider looking in, cognisant of some of the tacit practices, which I used to develop the politics of lending thesis.

4.9 Conclusion

In this chapter, I discussed how I designed the case study, and the theoretical (conceptual) framework I used to frame the research. I reiterated how important it was to incorporate literature from economic, social, and financial history, financial intermediation theory, pecking order theory, trade credit theory and technological capability framework to capture the richness and complexity surrounding financing technological capability upgrading and innovation in local ARV manufacture in Zimbabwe. I discussed how I delimited the study by focusing on financing of ARV manufacture using a finance lens within an innovation scope, with particular interest in technological capabilities at firm level (pharmaceutical companies) and lending technologies at banks surrounding access to finance. I detailed how I purposively chose my sample companies to interact with, how I approached key informants, and the challenges I faced and how I overcame them. I also discussed how I collected data and how I analysed it. I discuss this data in detail in chapters 5, 6 and 7, and analyse it in chapter 8.

Chapter 5: ARV Manufacturing in Zimbabwe

5.0 Introduction

In chapter 1, I argued that financing of local pharmaceutical manufacturing in Africa and the complexities surrounding financing local drug production have been neglected in contemporary academic and professional discourses. In chapter 2, I discussed the background to African financial systems and pharmaceutical manufacturing to give the African context. I also discussed the background to Zimbabwe's political economy, financial systems, the rise of manufacturing, pharmaceutical manufacturing, and the story of ARV manufacture in the same chapter. I built the theoretical framework in chapter 3 and discussed the methodology in chapter 4. In this chapter, I present empirical evidence on financing of working capital requirements and fixed (capital) investment by pharmaceutical companies for ARV manufacture in Zimbabwe.

I focus on empirical data that addresses, with respect to pharmaceutical companies, research questions 1, 2 and 3 detailed below:

1. How are capital investment and working capital requirements for ARV research and development, and manufacture financed?
2. As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?
3. At firm level, what technological capabilities are required for pharmaceutical companies to apply for finance and for banks to assess and advance loans?

To address research question 1, I focus on the sources of funds used by Zimbabwean pharmaceutical companies in comparison to sources of finance for industry such as foreign direct investment, internal sources of finance, bank debt, and venture capital and capital markets (see sections 2.7 and 3.7). To address research question 2, I focus on the role that commercial banks play in financing ARV manufacture in Zimbabwe based on section 3.3, where literature suggests

that banks played a critical role in industrialisation of other countries. In section 3.2.4, I discussed the relevance of trade credit as a source of short-term in-kind finance for financing working capital in enterprises. In this chapter, I also focus on trade credit as a source of finance for local pharmaceutical companies in Zimbabwe. I use the pecking order theory (section 3.4) to understand how managers choose which source of finance to fund the manufacture of ARVs in Zimbabwe. Lastly I apply Lall's (1992) technological capability framework to understand the technological capabilities necessary for a productive firm to access financial resources for physical investment that stimulates technological capability upgrading and innovation. I however focus more on the investment capabilities, especially the missing link of project finance capability and how the companies access financial resources for physical investment and financing their operations.

It is important to note at this point that I focus on two types of finance for enterprise; working capital finance and capital or fixed investment finance. Working capital is defined as current assets less current liabilities (Fazzari and Petersen, 1993). The current assets are debtors, cash and cash equivalents, stock (inventory), short term investments and pre-paid expenses, whilst current liabilities (all payable within one year) include creditors, short-term borrowings, current maturities of long-term debt, taxes and wages and salaries (ibid). Working capital management involves management of current assets and current liabilities in corporate finance and consequently determines the liquidity and profitability of a company (ibid). Assets can be a source of funds for the company if current assets exceed current liabilities, a positive working capital situation. A positive working capital situation leads to liquidity such that the company relies less on expensive external finance for day-to-day operations (Fazzari and Petersen, 1993; Mathuva, 2010). Working capital finance funds day-to-day operations for a company, covering amongst other things, payment of wages, raw materials, and selling and general expenses (ibid).

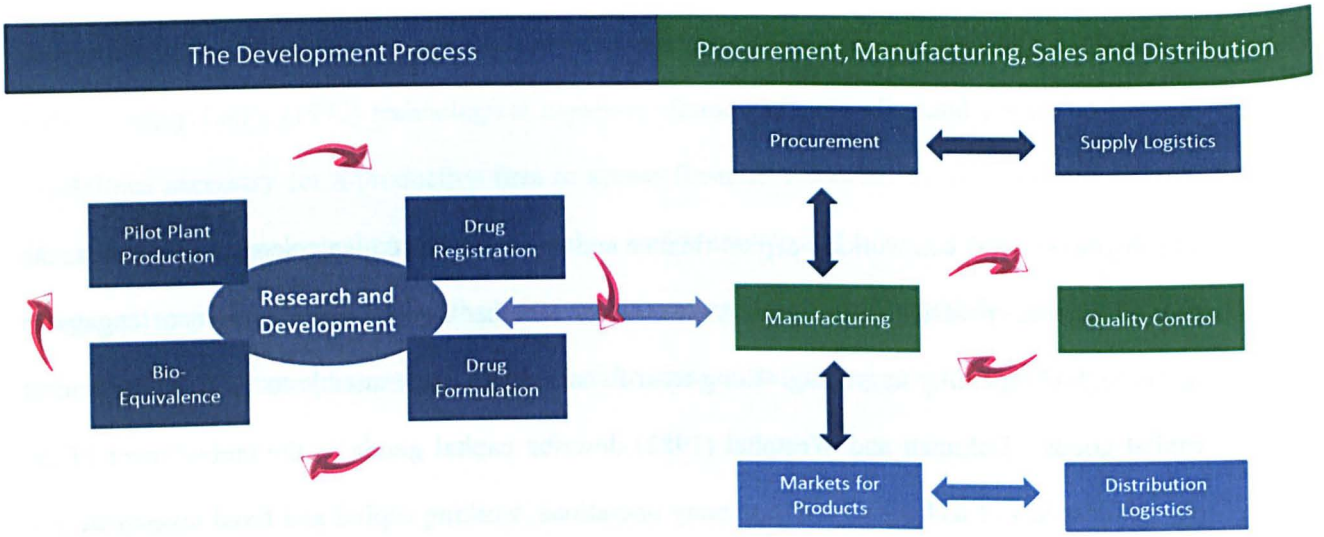
Capital investment or fixed investment, on the other hand, finances acquisition or replacement of machinery, equipment and plant and funding of the permanent portion of core working capital

(Fazzari and Petersen, 1993; Mathuva, 2010). Capital investment finance comes in the form of long-term debt, equity or FDI (see section 3.2). Capital investment is viewed as patient capital required for financing innovation and technological capability upgrading. Consequently it is not surprising that capital investment features in many debates on the ability of local pharmaceutical companies to develop.

The distinction between working capital finance and capital or fixed investment is important as the type of finance available to a company determines whether it will barely survive or engage in technological capability upgrading. Long-term finance is the most suitable to fund importation of capital goods. Dahlman and Westphal (1982) describe capital goods as the embodiment of the physical aspects of technology. In company operations, working capital and fixed investment can compete for the same money, making the issue of getting the right type of finance for the right type of project critical (Fazzari and Petersen, 1993). With this background in mind, I consider sources of working capital finance and capital (fixed) investment finance for manufacturing of ARV drugs in Zimbabwe.

For the purposes of the discussion on financing ARV manufacture in Zimbabwe, it is important to point out that there is only one company currently manufacturing ARVs in Zimbabwe. Another company that used to manufacture ARVs has since stopped and a third company is planning to manufacture ARVs. Therefore, the bulk of the discussion revolves around evidence from the company manufacturing ARVs in addition to the views of the company about to commence ARV manufacture and the one not manufacturing ARVs. The discussion will not involve calculating working capital or fixed investment requirements or any analysis of the financial accounts of the company, as I could not access them. All the companies I interacted with are privately owned and have no obligations to make their financial statements public. The evidence that I present on sources of finance for working capital investment was obtained from interviews with pharmaceutical company executives and management. To enrich the discussion on financing

ARVs in Zimbabwe, I incorporated evidence from the two other companies not currently manufacturing ARVs. Their reasons why they have not commenced manufacturing ARVs tell the story of ARV manufacturing from another angle.



Source: Developed with input from Director, Research and Development, 2011; Production Manager, 2011; Procurement Manager, 2011; Marketing Manager, 2011.

Figure 10: The business of ARV Manufacturing in Zimbabwe.

I set up the chapter to follow the structure in Fig 10. In section 5.1, I discuss the research and development followed by procurement in section 5.2. In section 5.3, I discuss the manufacturing process narrowing down on financing of machinery acquisition in section 5.4. I focus on project finance in section 5.5, followed by markets for drugs in section 5.6, and conclude the chapter with section 5.7. The other boxes are discussed in function as part of other discussions related to the study.

5.1 Research and Development

In this section, I discuss the research and development process (see Fig 10) and sources of finance for these operations.

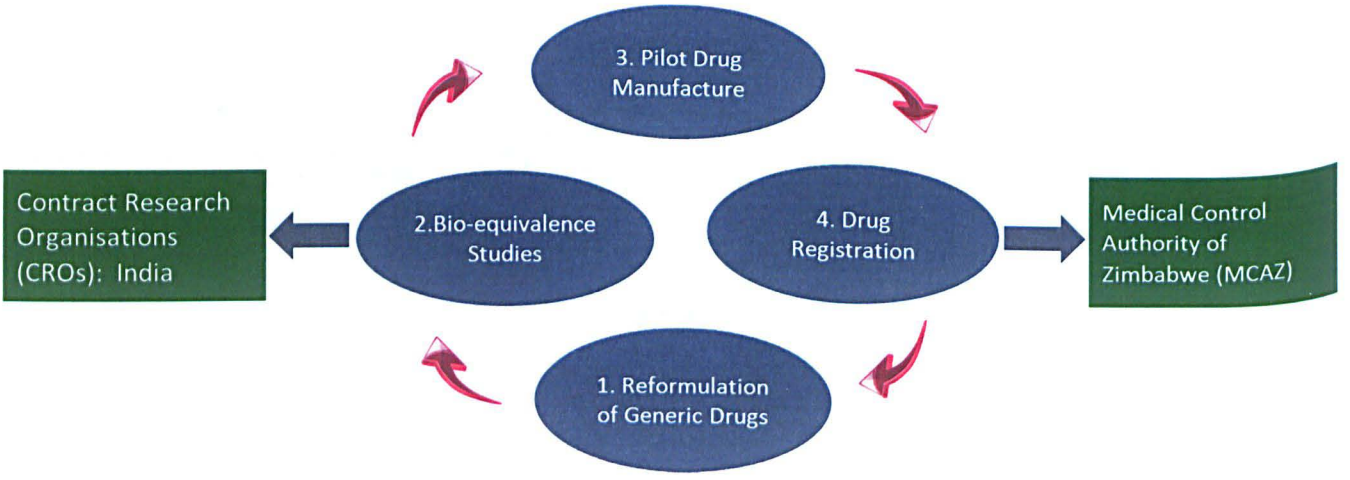
The pharmaceutical manufacturing business model in Zimbabwe as discussed in chapter 2 is based on the secondary activity of generic drug manufacture, with research and development activities limited to formulation development (UNIDO, 2007, 2011b). Zimbabwe however, is an active centre for clinical trials for new drugs especially HIV/AIDS drugs by international pharmaceutical companies as evidenced by research papers presented at the AIDS conference held in Harare in September 2011[17].

Current research and development (R&D) activities in Zimbabwe (see Fig 11) are limited to formulation development and the local value chain starts at re-formulation of generic drugs and adaptation to local conditions. Bioequivalence studies are done by Contract Research Organisations (CROs) in India, and drugs are registered with the Medicines Control Authority of Zimbabwe (MCAZ) (Research and Development Director, 2011).

The R&D laboratory searches patents, identifying potential products whilst ensuring they are not infringing any patents. They try to improve on the formulation utilising TRIPS flexibilities, which allow generic drug manufacturers in developing countries to come up with formulations for the domestic market (Research and Development Director, 2011). All raw materials for the development process of ARVs are imported (Research and Development Manager, 2011). ARV formulations currently under development include Efavirenz, Tenofovir with combinations of Lamuvudine and Nevirapine (Research and Development Director, 2011; Managing Director 1,

[17] The National Aids Council in Zimbabwe hosted an annual AIDS conference which was held at Celebration Centre in Harare in September 2011. The researcher attended this AIDS conference and interacted both with presenters and participants to gain an in depth understanding of the HIV/AIDS terrain in Zimbabwe and the relevance of ARVs being manufactured locally.

2011). Nevirapine formulations are in tablet form for adults and paediatric syrup formulations for children.



Source: Developed by author with information from Fieldwork (2011); UNIDO (2011b)

Figure 11: ARV research and development activities in Zimbabwe.

After development activities, the formulations are sent for bioequivalence studies at Contract Research Organisations (CROs) in India (ibid). Bioequivalence studies test whether the formulation is comparable in terms of efficacy and other drug properties; drug metabolism, drug delivery and blood levels in the body. Local companies argue that they use Indian CROs because they are cheaper. CROs in India charge US$ 40 000 for a single dose formulation and up to US$ 100 000 for fixed combination doses of ARVs (ibid). CROs from Europe or North America are more expensive as USA CROs charge from US$150 000 to US$200 000, and Canadian CROs charge from US$ 140 000 to US$180 000 (ibid). Western Europe CROs on the other hand charge from US$ 120 000 to US$160 000, Eastern Europe CROs charge from US$80 000 to US$160 000 (Managing Director 1, 2011; Research and Development Director, 2011). AIBST[18] a local research

[18] AIBST (African Institute of Biomedical Science & Technologies) was chosen as one of the centres of excellence for Africa at African Network for Drug and Diagnostics Innovation (ANDI) to spearhead In-silico Drug Metabolism & Pharmacokinetics and Toxicology Studies I met Professor Masimirembwa at an ANDI

organisation argues that bio-equivalence studies done in India can be done in Zimbabwe at a lower cost, with an added advantage of physiological studies being much closer to final users of drugs. To date the local pharmaceutical industry shows no indication of using local research institutions such as AIBST in spite of it being an ANDI centre of excellence (Nwaka *et al.*, 2012) to spearhead in-silico drug metabolism & pharmacokinetics and toxicology studies in Africa. ANDI centres of excellence in Africa serve as nucleation centres for innovation and technology transfer (ANDI 4th Stakeholders Conference, October 2011).

The failure of Zimbabwean pharmaceutical companies to use a local research organisation; AIBST demonstrates a lack of linkage capabilities Lall (1992). By choosing not to develop local R&D linkages and going for a more expensive external linkage, the local pharmaceutical companies are foregoing an important innovation opportunity and negating efforts to develop local backward linkages instrumental for improving technological effort and innovation capabilities (Dahlman and Westphal, 1982). Lall (1992) asserts that linkages impact productive efficiency, diffusion of technology as well as deepening of industrial structure. Thus a strategic decision to use Indian CROs increases financial costs and from an innovation perspective, has retrogressive effects on technological efforts and local technological capability upgrading. This deficit emanating from lack of linkage capability imposes both a financial cost and a technological effort loss for the integrated industry.

Turning to licensing of drugs, lead times to licencing a product can take up to two years or more (Managing Director 1, 2011). The period is made up of 3 months to produce a dossier, up to 12 months to get approval from the drug regulatory authority, MCAZ (although they claim it can be done in 6 months), and chemical stability tests taking up to 12 months (ibid). Development activities are long-term projects, which need to be funded by long-term finance. The Managing

conference and he also confirmed that they can carry out bio-equivalence tests locally even though the local pharmaceutical companies have not yet started using their services.

Director of one pharmaceutical company reiterated the long-term nature of development activities in the remark below:

> "It takes almost two years to get the drug registered. So the investment that you put in now, you are bound to recoup after two years. So it's more like a long term capital commitment" (Managing Director 1, 2011).

Capital investment and working capital requirements for research and development activities are financed by internally generated funds (Research and Development Director, 2011; Managing Director 1, 2011). This presents a problem for Zimbabwean companies which are not cash rich. Consequently they can spend up to three years saving foreign currency to purchase machinery and equipment (ibid). They mastered this saving approach and strategy during the hyperinflationary environment and were able to lock their value in physical investment to preserve value (ibid). The companies leveraged EU tenders to save foreign currency, which they used to also fund research and development activities, in addition to capital equipment acquisition mentioned earlier (ibid). They had to surrender a portion of their foreign currency earnings at varying proportions as the regulations set by the Central Bank at official exchange rates (Managing Director 1, 2011). Reliance on savings and retained earnings where demand for drugs is low (see section 5.4) forces local pharmaceutical companies to wait until they have saved enough to import capital goods. The implication is that local pharmaceutical companies cannot compete with other countries' pharmaceutical companies that are cash rich or have access to long-term finance for capital investment. Finance though is not the only challenge that the companies face in research and development as reflected in the quote below:

> "I am saying there is lack of finances and resources but also knowledge and expertise is important." (Research and Development Director, 2011).

The above quote precipitates the gravity of lack of long-term finance. However, over and above this, it is the linkages to and with skills, knowledge, and technological capability (Lall, 1992) embodied in human capital; the know-how, know-who and know-why of learning and knowledge (Ernst and Lundvall, 1997) critical for innovation that is telling. During the hyperinflation era, one company shrunk its R&D team by 50% and was only starting to rejuvenate those functions at the

time of this research (Research and Development Director, 2011). Human capital emigrated to South Africa and Europe (ibid).

The fact that finance is raised in tandem with skills, knowledge and expertise challenges reinforces my earlier assertion that finance is part of an integrated larger system in the context of national system of innovation, knowledge, learning and innovation (Ernst and Lundvall, 1997; Lundvall, 1998; 2007). However, it also reveals the challenge of technical expertise not only in R&D, and production but also in the finance department, where the finance team is supposed to be technically competent to synthesise robust project finance proposals to access external finance from international and regional financiers as I discuss in section 5.5.

Local R&D activities are limited to formulation development with no drug discovery activities. The R&D activities and R&D equipment acquisition are financed using internally raised funds. The local pharmaceutical companies contract Indian CROs for bioequivalence studies leaving a local institution AIBST, thereby missing an opportunity of deepening local industry through linkages. The challenges that the R&D function faces are not limited to lack of finances only but human capital challenges through loss of skills and expertise (see also section 7.2.3).

5.2 Procurement

In this section, I discuss the procurement function and its role in managing working capital requirements. The procurement function sources and arranges for delivery of APIs (active pharmaceutical ingredients), excipients, packaging materials, consumables, and utilities. Equipment and machinery for the R&D laboratory, Quality Control laboratory and factory is procured in conjunction with the heads of the functions (Procurement Manager, 2011). The local, regional or international sources of inputs, machinery and equipment are shown in Table 18 below.

Table 18: Sources of raw materials, machinery, and equipment for pharmaceutical companies.

Procured Items		Source		
		Local	Regional	International
Raw Materials	APIs			
	Excipients		✓	✓
	Packaging	✓	✓	
	Dessicants		✓	✓
Consumables	Water Purification Filters		✓	✓
	HVAC Filters		✓	✓
	Cleaning and Sanitising Materials	✓	✓	
	Fuel	✓		
Utilities	Electricity	✓	✓	✓
	Water	✓		
Spare Parts	Production Machinery		✓	✓
	Laboratory Machinery		✓	✓
Protective Wear	Hairnets		✓	
	Mouth Guards		✓	
	Worksuit		✓	
Procured in Conjunction With Production, Research & Development and Quality Control Departments				
Production Machinery	Milling Equipment			✓
	Blending Machines			✓
	Slugging Machine			✓
	Compression Machines			✓
	Fluid Bed Dryers			✓
	Coating Machines			✓
	Encapsulation Machine			✓
	Automatic Tablet Counters			✓
	Automatic Packaging Machines			✓
Research and Development	APIs			✓
	Excipients		✓	✓
	Pilot plant modelled on Production Plant			✓
	Analytical Instruments			✓
Quality Control	Lab Reagents	✓	✓	✓
	Analytical Instruments			✓

Source: Developed with input from Procurement Manager, 2011; Managing Director 1, 2011; Marketing Director, 2011.

5.2.1 Source of API

Shanghai Desano in China and Aurobindo in India are the main suppliers of APIs for ARVs (Procurement Manager, 2011). Currently there are no African suppliers of APIs for ARVs, hence dependence on imports (ibid). Excipients are procured from brokers and regional suppliers in South Africa (ibid). Reliance on two suppliers for ARVs Shanghai Desano and Aurobindo is

because of WHO pre-qualification status which requires audited documents, as reflected in the remark below:

> "There are a lot of Asian companies who sell ARV raw materials but very few have the necessary requirements, such as audited documents." (Procurement Manager, 2011).

The audit requirement forces procurement of APIs for ARVs from companies with audited documents (ibid). To compound the problem the same Chinese and Indian suppliers with audited documents are vertically integrating and venturing into ARV manufacturing (ibid). This has led them to either raise prices of APIs or undercut local manufacturers on price of finished products when competing for tenders in Zimbabwe or the region (Procurement Manager, 2011).

Supplies for APIs and excipients are paid for in cash and in advance, because of country risk; a historical phenomenon from when Zimbabwe had serious foreign currency shortages (ibid). Local companies have low bargaining power because of small quantities purchased, and suppliers are not bothered if they lost Zimbabwean customers as reflected in the remark below:

> "I think it's both [country risk and the quantities we purchase], because our quantities are not really significant to their book, if they lose us as a customer it's not a big deal to them, because they will tell you I have got someone who buys 5 tonnes at a time. But I buy at most a tonne if I have got a tender. Bargaining power is almost zero. At the moment they actually dictate to you what the price is, and what the payment terms are. In the case of Shanghai Desano, they have tried to accommodate us, and they say we will give you terms but we need an LC (letter of credit).... we are funding the LC, so it's not really a term, because it is covered by an LC...[where there are high bank charges] establishment charges and so on." (Procurement Manager, 2011).

As a result of these dynamics, local pharmaceutical companies procure raw materials from merchants and brokers with the volume business to procure container loads (15 to 30 tonnes). Brokers ship APIs and excipients to South African brokers who then sell smaller quantities at higher margins to local pharmaceutical companies (Procurement Manager, 2011). Where international suppliers tried to accommodate them, they cover themselves from payment and country risk by demanding a letter of credit (LC) (ibid). An LC costs 2.5% of the LC value, plus establishment fees for each transaction in bank charges. Approaching banks for the LC forces the company to incur high bank financing costs defeating the whole purpose of trade credit (see section 3.2.4), which is supposed to reduce the need for expensive bank finance.

There are a number of potential suppliers of APIs in India such as Ranbaxy, Matrix, Strider, Hetero and Cipla, with documentary requirements; however they are more expensive (Procurement Manager, 2011). The price differential can be as much as US$ 20 per kilogram, a huge differential "when you are talking about third world countries" (ibid). Efforts are being made to increase suppliers and increase competition (ibid). Excipients as mentioned earlier are sourced from brokers and traders in South Africa, and Warren Chemicals and Savana are the main suppliers, but they still demand advance payment (ibid). This is at variance with practice in East Africa where local pharmaceutical manufacturers get terms of up to 90 days from Germany and other suppliers of APIs and excipients, which reduces their working capital financing requirements (EAC PMPOA, 2011). Germany suppliers source in bulk from India and China and sell small quantities to local manufactures in East Africa, giving credit terms of up to 90 days, thus alleviating the need for expensive bank finance. Lack of trade credit in Zimbabwe is reflective of national technological capability failure (see chapter 7). As a result of macroeconomic instability, local firms shoulder risks emanating from a broad national economic performance and issue.

Zimbabwean pharmaceutical companies finance suppliers in India and China, a situation similar to a perverse subsidy discussed by Mackintosh (2009), where the developed world benefits from the developing world although in this case India and China are not necessarily classified as developed countries. By financing suppliers, the resultant cashflow squeeze forces them to resort to expensive

bank finance characterised by high interest rates of up to 30% per annum, multiple management and drawdown fees per year (see chapter 6). It has not always been like this in Zimbabwe. Fafchamps (1997), using evidence from the 1993 World Bank sponsored Regional Program for Enterprise Development (RPED) panel survey of 200 companies, found out that trade credit played a significant role in financing enterprises in Zimbabwe. Trade credit as a percentage of outstanding balances constituted 27% for micro enterprises; 26% for small enterprises; 30% for medium enterprises; and 30% for large enterprise (ibid). The economic and political deterioration that occurred in the 2000s decade caused a high level of uncertainty, shortage of foreign currency and increased country risk. Consequently local pharmaceutical manufacturers cannot access trade credit from suppliers of the most expensive raw materials; APIs and excipients (see section 5.3). The dearth of trade credit and reliance on expensive bank finance throttles financial breathing space for the companies. Current efforts to establish bonded warehouses (see section 5.2.2 below) in Zimbabwe to lessen shipping time and extended capital outlay through advance payment are a commendable strategic management move, that can assist in better managing working capital.

I now turn in the next section to clearance of imported supplies, costs, and requisite financing.

5.2.2 Clearance of goods, lead times and shipment costs

Supplies brought in by sea take 6 to 12 weeks to land in Zimbabwe depending on time taken to consolidate and clear shipments at Beitbridge border post (Managing Director 1, 2011). Beitbridge border post is a key entry point for goods into Zimbabwe shipped by sea through Durban and later by road to Beitbridge. It is also a key entry point for goods travelling up north from South Africa to Zambia, Malawi, Tanzania and the Democratic Republic of Congo (ibid). For airfreighted goods, the delivery period is reduced to 4 weeks at a cost of US$ 2-5 more per Kg. When shipping small quantities of very expensive APIs, they prefer to import by air (ibid). However, for bulky and cheap goods, sea freight is more expedient (Managing Director 1, 2011; Procurement Manager, 2011). The major determinant of shipment mode is therefore cost of goods relative to shipping costs per kilogram. The logic is that freight cost should not exceed 10% of purchase cost, thus

when importing an API costing US$500 per Kg, airfreight is the choice of transport (Managing Director 1, 2011; Procurement Manager, 2011). Sixty per cent of raw materials in value terms come in by airfreight and 40% by sea, however in terms of quantity (volume), 90% comes by sea, and 10% is airlifted into Zimbabwe reflecting the expense of APIs compared to other raw materials (Managing Director 1, 2011).

The significance of this relates to national technological capabilities in terms of institutions and capabilities that determine infrastructural architecture, incentives covering import duties and taxes and the institutions that determine the level of bureaucracy involved in customs clearing of imported goods. Goods clearing cost is a flat 1% of duty value of the consignment; a summation of Cost Insurance and Freight (CIF) and any other storage and transportation costs up to the border. Finished drugs (ARVs) and raw material imports (APIs and excipients) for ARVs are exempt from duty, however, local manufacturers still pay value added tax upfront for non ARV raw materials. The arrangement is that VAT can be claimed from the Revenue Authorities; a long and cumbersome process (UNIDO, 2011b). Other consumables such as filters imported from South Africa as mentioned earlier are not exempt from duty (Procurement Manager, 2011). Local companies invariably have higher manufacturing costs.

Long clearance periods and high duties, as is the case in Zimbabwe prejudice the pharmaceutical companies as they are forced to fund stockpiles of idle raw materials and incur high charges to clear them (ibid). These timeframes affect delivery timelines for local manufacturers in addition to ratcheting up the cost of local manufacture on local tenders for ARVs (ibid). Local wholesalers and agents for Indian pharmaceutical manufactures, procure finished ARVs duty-free from India, with a lead-time of just 3 weeks. This is in contrast to 8 to 12 weeks lead time for raw materials ordering, shipment and clearance by local manufacturers, followed by an additional 4 weeks to manufacture ARVs before delivering finished product. Local companies thus find it difficult to compete with the finished ARV imports on local tenders if the local preference of 10% price differential is not used.

The local pharmaceutical companies have however come up with an ingenious process innovation in in-country bonded warehouses. The intention is for bonded warehouses to be built in Zimbabwe and Chinese or Indian suppliers to ship APIs or excipients on consignment at their own costs to Zimbabwe (Managing Director 2, 2011). The ownership of the goods (title) essentially remains with the supplier until the local pharmaceutical company pays for all costs including customs and duty fees. Then the goods are cleared through customs and become the property of the local company (ibid). This cuts out the 8 to 12 week lead-time, which needed to be financed either internally or through expensive bank finance. By doing so, it eliminates high stock holdings, which lock up valuable cashflows in inventories (Managing Director 2, 2011). This is a key technological capability of leveraging economic linkages between suppliers and the company in its supply chain financing, reducing working capital finance requirements in an environment where trade credit is not available.

In summary APIs and excipients, the most expensive raw materials are all imported and paid for in cash and advance. Trade credit, a key source of in-kind finance from suppliers is not available because the Zimbabwean pharmaceutical companies have low bargaining power and the suppliers also try to hedge themselves from payment risk and foreign currency availability risk. The payment risk was caused by foreign currency shortages before Zimbabwe started using a basket of foreign currencies. The companies have arranged for bonded warehouse arrangements where they shorten the lead times to get essential raw materials and also shorten the times when they are out of pocket when they pay for raw materials in advance.

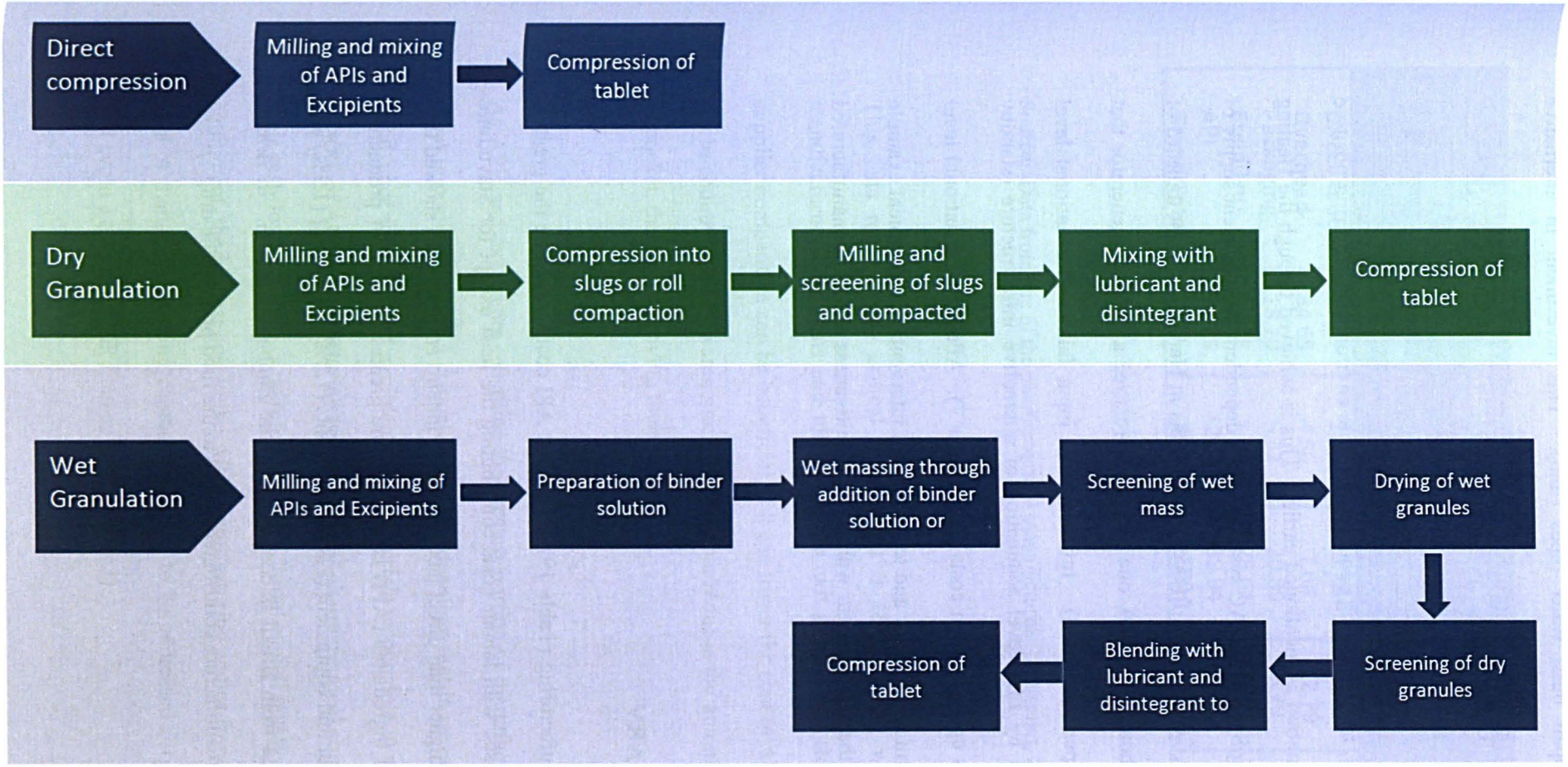
5.3 The Manufacturing Process

In this section, I briefly describe the tablet manufacturing processes. I do not delve into specific details of the mechanics of tablet manufacture as my focus for this study was on machinery and equipment; how it is procured and the suppliers.

The major inputs are APIs (the most expensive), excipients, packaging materials, and coating materials. Most packaging materials for ARVs are cheap because they are obtained locally (Production Manager, 2011). The main tablet manufacturing processes (see Fig 12) are direct compression, dry granulation, and wet granulation (ibid). Excipients are pharmacologically inactive substances used as a carrier for the active ingredients of a medication or as lubricants during the manufacturing process (Production Manager, 2011). APIs, excipients and other raw materials are prepared in the weighing room under positive pressure to avoid cross contamination (ibid). The weighing and preparation area is separate from other areas, and sensitive analytical balances are used to weigh APIs. The ingredients are then transferred for processing.

In the direct compression route, (Fig 12) APIs and excipients are mixed and milled followed by compression into tablets and thereafter packaging (ibid). In dry granulation, the process is more involved and starts with milling and mixing of excipients followed by compression into slugs. The slugs are milled a second time and mixed with lubricants and dis-integrants. The mixture is compressed into tablets and packaged. In the wet granulation route, (Fig 12) the first step is milling and mixing of APIs and excipients. A binder solution is prepared and added to the mix, leading to a wet mass. The wet mass is screened followed by drying of the wet granules in the fluid bed dryer (Fig 15). The dry granules are screened and blended with lubricants and dis-integrants to produce a running powder, which is compressed into tablets and packaged (ibid).

Pharmaceutical manufacturing requires water of high purity. Potable water delivered by utility providers in Harare or Bulawayo does not meet pharmaceutical manufacturing standards (ibid). Consequently, on-site purification of water is done using the reverse osmosis plant (see Fig 13) to produce water of required microbiological purity and conductivity standards (ibid). The poor water quality causes high soiling rates for filters and frequent replacement, causing high manufacturing costs. The imported filters are subject to customs duty and VAT (Procurement Manager, 2011).



Source: Prepared by author with information from the Production Manager (2011).

Figure 12: General Tablet Manufacturing Processes

To alleviate water cuts, pharmaceutical companies sank boreholes to supply water when municipalities take long to repair burst water pipes (ibid). This investment in alternative infrastructure imposes additional manufacturing costs on local companies (see chapter 7).

For the WHO-prequalified plant, manufacturing occurs in a sterile environment requiring positive pressure to avoid cross contamination as mentioned earlier. This is achieved through the Heating Ventilation and Air Conditioning System (HVAC system) highly dependent on consistent supply of electricity (Production Manager, 2011). With frequent power cuts in Harare (it is not unheard of for power cuts to last up to 5 hours in a day), one company procured a 500KVa generator that consumes 110 litres of diesel per hour (ibid). Infrastructural input failure at a national level (energy provision) is mitigated by firm level acquisition of alternative infrastructure (standby generators) which further builds up production costs (see chapter 7). Alleviating a national level policy and practice failure by firm level policy and technological intervention is a typical example of policy and practice gridlocks that do not augur well for competitiveness of locally manufactured drugs (see section 7.2.1).

5.3.1 Cost structure of ARV

The cost structure of ARV manufacturing (Table 19) shows that API costs constitute the greatest contributor to manufacturing costs, with labour costs contributing the least except for Stavudine. Allocated costs are appreciably higher than direct labour costs. Pinheiro *et al.*, (2006) showed that in Brazil, active pharmaceutical ingredients (API) constituted the greatest portion of production cost (mean of 65.8%), with labour and equipment (1.8%), excipients (1.2%), packaging (1.3%) and quality control (4.6%). The data from Brazil is confirmed by the Zimbabwean data. In Brazil, overall total direct cost of ARV manufacture contributed 74.8% to the final price of the drug.

Table 19: Cost structure of ARV: ex-factory price.

Percentage (%) Contribution by Value To Manufacturing Costs							
	Stavudine	Lamuvidine/ Zidovudine	Vari-Stavudine	Nevirapine	Lamuvidine	Stalanev	Zidovudine
Direct Labour	17.07	2.30	3.78	6.30	6.27	2.49	3.72
Overhead	34.65	4.66	7.68	12.79	12.73	5.06	7.56
Packaging	18.10	5.32	20.89	8.79	21.40	8.29	3.76
Excipients	12.88	5.42	28.61	9.23	8.22	2.82	4.13
API	17.29	82.31	39.04	62.88	51.38	81.33	80.83
Grand Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Data from one of the pharmaceutical manufacturing companies, 2011

This data reveals how critical trade credit is for lowering working capital finance for the manufacturing operations and ultimately the exit price. The strategy to increase suppliers and supplier competition can be beneficial, if it can lower the cost of APIs and excipients, in addition to the in-country bonded warehouses strategy that reduces the amount of time the companies are out of pocket, thereby improving their liquidity.

As APIs and excipients constitute the greatest portion of manufacturing cost, trade credit assumes great importance and is a critical financing advantage that is currently being lost. By paying cash in advance for APIs and excipients; raw materials responsible in many instances for more than 70 to 80% of ARV manufacturing costs, the local pharmaceutical companies are severely squeezed in their cashflows. It follows therefore that after initial capital outlay for acquisition of machinery and equipment, the highest cost in the ARV manufacturing comes from APIs, making trade credit a key area of managing working capital that needs to be addressed for access to cheap in-kind finance and avoid expensive bank finance (see chapter 3).

5.4 Financing the Acquisition of Machinery

In this section I focus on financing of acquisition of machinery and discuss sources of finance for capital investment, the reasons why companies used those sources, and why they procure analytical and laboratory equipment from Germany and Japan and from production equipment from China and India. The companies imported new machinery such as the fluid bed dryer, tablet coating machine, automatic tablet counting machine, and analytical equipment. As Table 18 shows, not all machinery is old as shown by machinery age ranges for Datlabs, Plus 5 and Varichem (see also Fig 13 to Fig 21).

5.4.1 Determinants of which machines to procure and from where

Production machinery and equipment is imported from India and China where the prices are affordable compared to Western Europe equipment prices (Managing Director 1, 2011; Managing Director 2, 2011; Procurement Manager, 2011; Production Manager, 2011). Finance (foreign currency) to procure equipment and machinery was raised internally, and this was the major determinant of which machine to purchase and from where (Managing Director 1, 2011; Managing Director 2, 2011; Procurement Manager, 2011; Production Manager, 2011). Consequently, production machinery and equipment were imported from India and China (Managing Director 1, 2011; Managing Director 2, 2011; Procurement Manager, 2011; Production Manager, 2011). The use of internally generated funds is not driven by pharmaceutical companies being cash rich, but by necessity, due to the unavailability of long-term finance (foreign currency) (Managing Director 2, 2011; Production Manager, 2011). Lease finance and asset backed lending technologies have not been active in Zimbabwe for over a decade as finance houses and merchant bank operations were de-emphasised. However, even if they had been operational they would still have to face the foreign currency scarcity challenge in availing lines for importing technology (see chapters 2 and 6). Reiterating the lack of long-term (foreign currency) finance, a Production Manager with one of the pharmaceutical companies said they hardly got any loans in the last decade and consequently they were forced to save money and procure affordable production equipment and machinery from

India and China. Explaining the determinants of where to procure machines from and why, the Production Manager remarked as follows:

> "First and foremost the economy that we are operating in results in a lot of challenges. We have a lot of other things to do so we prefer to go for cheaper equipment. It takes long to save and even if you save you opt for something cheaper so that you can balance a lot of things and make up for other requirements.....to save for a USD 700K machine it can take more than a year or two years...raw materials are expensive and sometimes when we get foreign orders, the money goes to buy raw materials, sometimes we have to divert that money to say salaries or something else. So saving even USD 100K can take us very long depending on the circumstances" (Production Manager, Pharmaceutical Company A, 2011).

Relying on saved funds (foreign currency) to purchase machinery and equipment slows the rate of technological capability upgrading. Companies do not purchase state of the art technology, but what they can afford in order to balance a lot of things, as in the quote above. This has serious implications for technological effort, learning, and knowledge, and rapid permeation of leading technology in the industry and local economy through adoption and adaptation by local skills (Lall, 1992; Ernst and Lundvall, 1997). Consequently, capacity expansion is hampered for long periods (for example the two years in the quote above) as companies starve operations of working capital whilst saving for new machinery. Juggling many things and trying to allocate meagre internal resources points to firm level intervention augmenting financial disintermediation; a key national technological capability level failure where banks or financial institutions fail to function as catalysts for industrial development (see chapters 3 and 6). The dearth of long term savings (in this case foreign currency) and the institutional capacity and capability in the form of merchant banks is one of the drivers of this malady (Group Chief Executive, Domestic Bank F, 2011). This underscores the importance of project finance for the pharmaceutical companies to access finance to import technology from regional banks that are active in the long term finance arena.

Analytical machinery and equipment for research and development and quality control, are sourced from Japan and Germany using internal funds as reflected in a quote from the Managing Director of one pharmaceutical company:

> "Some [analytical equipment] we are getting from Germany, some especially the advanced ones from Japan, especially the testing equipment because these have to be world standard, in terms of certification and calibration, and the other ones [manufacturing machines] we are buying from China and India, because they are cheaper especially on production equipment" (Managing Director 1, 2011).

The Managing Director reinforced the choice determinants of suppliers of production equipment as being cost, whereas for analytical and laboratory equipment they pay for high quality capital goods. Purchasing cheap or affordable manufacturing equipment from India and expensive analytical equipment from Japan or Germany seems prevalent in sub-Saharan Africa as confirmed by conversations with pharmaceutical manufacturers from East Africa (Kenya, Tanzania, Uganda, Burundi, and Rwanda) at an East African Pharmaceutical Plan of Action Launch workshop in Arusha Tanzania in December 2011 (EAC PMPOA Workshop, 2011). Pharmaceutical players in East Africa explained that countries such as Germany are giving companies in India and China rights to manufacture production machines under license and Indian and Chinese manufacturers produce affordable machines for emerging markets pharmaceutical manufacturing companies whilst paying royalties to German companies (ibid). However, for analytical equipment the Germany companies would rather manufacture them than license out (ibid).

Table 20 below shows estimated costs of acquiring different types of machines from India or China based on discussions with two pharmaceutical companies. The last item in Table 20 is the cost of factory upgrades, which I discuss in chapter 7. Suffice to say that even factory upgrades were financed using internal funds for one company, whilst for Varichem it is well documented that a US$ 2.1 million loan was availed by UNDP (UNIDO, 2011b). The amounts of funds required for capital investment are huge and depending on internally generated funds means access to long-term

finance (foreign currency) is a major hurdle to technological capability upgrading, technology transfer and productive capacity expansion. This clearly shows that finance is one of the key drivers that determine the velocity of technological capability upgrading, innovation, learning, and the development of local African pharmaceutical companies.

Table 20: A sample of machinery and other activities required for pharmaceutical production activities and their cost.

Machine/Activity	Lower Cost	Upper Cost
Encapsulation Machine	200K	350K
Compression Machine	240K	400K
Tablet Counting Machine	400K	
Factory upgrade	1.3M	3M

Source: Prepared using information from Managing Director 1, 2011; Production Manager, 2011.

Figures 13 through to 21 are photographs of typical machinery and equipment that local pharmaceutical companies imported using internal funds. The equipment is of general use and can be used for ARV manufacturing as well as production of other pharmaceutical product lines. As mentioned earlier, acquisition of machinery and equipment was financed solely by retained earnings and savings in the last decade. Long-term finance (foreign currency) loans were not availed by foreign or domestic banks. Varichem and CAPS accessed funds from UNDP and Fredex Financial Services respectively (see chapter 6). Varichem obtained a US$ 2.1 million loan from UNDP, which was used for the factory upgrade, culminating in WHO pre-qualification (Consultant Pharmaceutical Industry, 2011; UNIDO, 2011b). CAPS, on the other hand, leveraged cross-ownership with Fredex Financial Services by the Executive Chairman to get shareholder loans that were applied to retooling the factory in addition to commercial bank short-term loans (CAPS Financial Statements, 2008, 2009, and 2010). I return to this discussion in chapter 6 and 7.

Figure 13: **The reverse osmosis plant used to purify municipal water.**

Figure 14: **A V-blender used to mix APIs, excipients and other ingredients.**

Figure 15: **A fluid bed dryer used in the wet granulation process of tablet manufacture.**

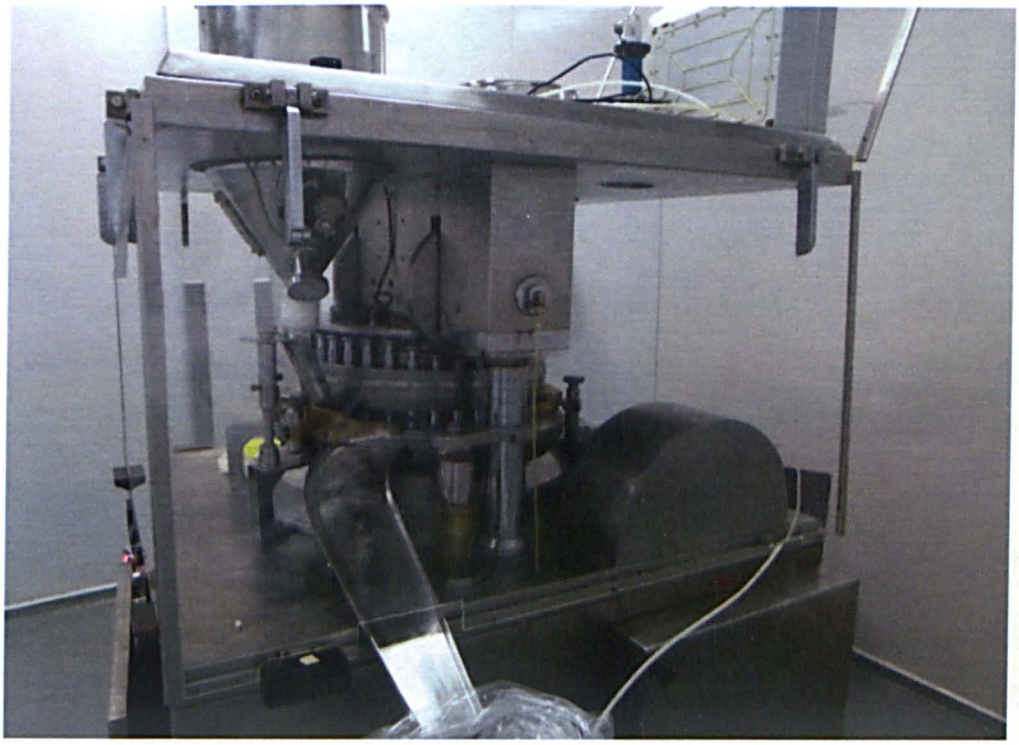


Figure 16: **A 35-station tablet compression machine used for tablet compression.**

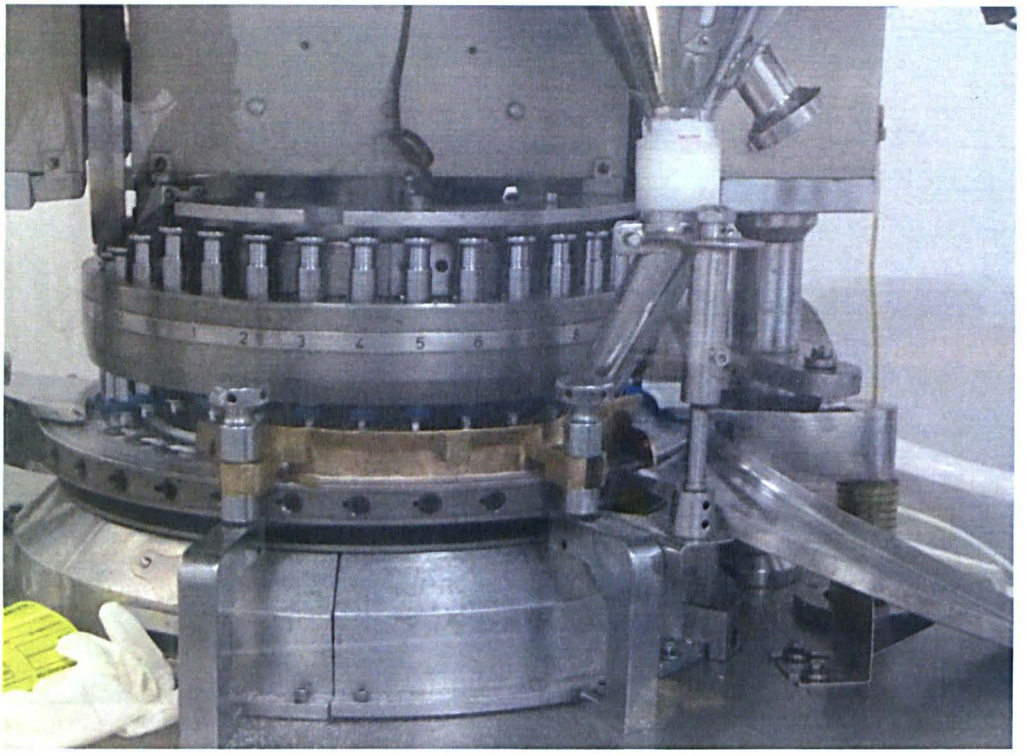


Figure 17: A close-up photo of the 35 station tablet compressing machines.

Figure 18: A coating machine to improve organoleptic properties of tablets.

Figure 19: **Packaging used for various types of ARVs.**

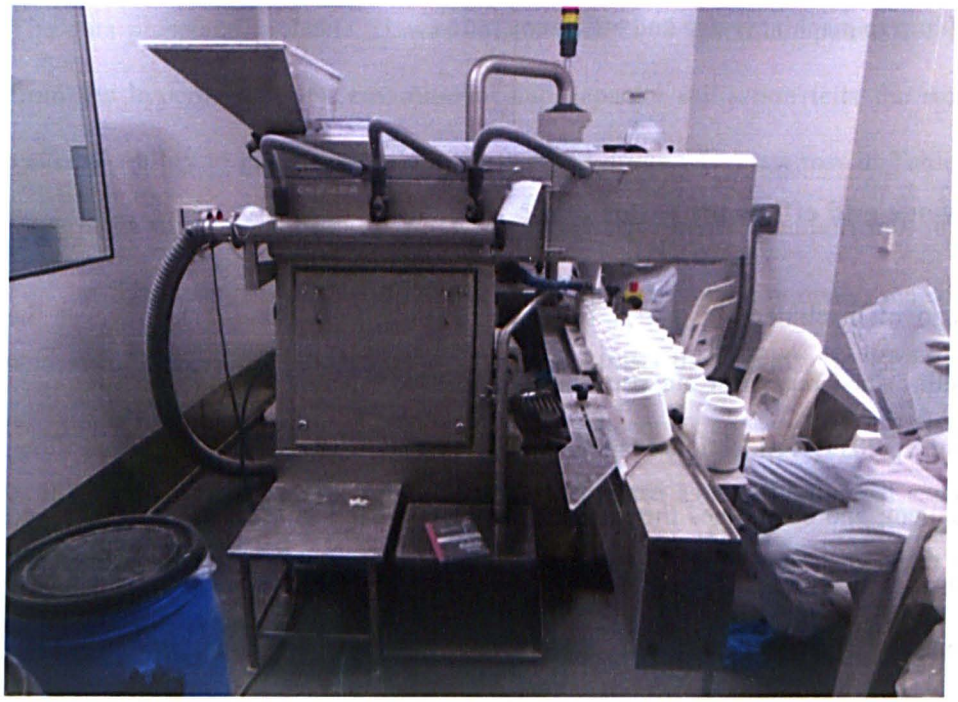


Figure 20: **An automated tablet counting machine.**

Figure 21: Automated tablet counting machine showing the console.

In the next section, I turn to machinery age and efficiency ratios.

5.4.2 Machinery age and efficiency ratios

The general life span of machinery in use is 10 years or more (see Table 21), however the machinery is not refurbished but worn out parts are replaced or repaired as and when required (Maintenance Engineer, 2011; Production Manager, 2011). Consequently, machines are slow, breakdowns are frequent, and sometimes the mechanisms of operation fail (Production Manager, 2011). Maintenance costs for one of the plants was estimated at US$ 20 000 per month (Maintenance Engineer, 2011). A detailed appraisal of status of manufacturing facilities, equipment age and funding requirements is documented in the UNIDO (2011b) report, a summary of which is presented in Table 21 below.

Table 21: State of manufacturing facilities, capacity utilisation, equipment age and funding requirements.

Status of Manufacturing Facilities: Capacity Utilisation, Equipment Age and Funding Requirements					
	Caps	Datlabs	Pharmanova	Plus 5	Varichem
Capacity Utilisation	20-30% (2009)	32% (2009)	Not known	17.5% (Plant shutdown for upgrades)	30-60%
Facility Design and Layout	Recently refurbished but requires HVAC	Requires upgrade. Requires HVAC	Not known	Requires upgrade. Requires HVAC	GMP Compliant, recently refurbhised. HVAC operational
Average Age of Equipment	Not known	16.5+yrs (Range 1 30 yrs)	Not known	8.25 yrs (Range 0.5-20 yrs)	9.6 yrs (Range 2-30 years)
Additional Pieces of Equipment Needed	Not known	24	Not known	30	18
Capital Required For Additional Equipment	Not known	US$ 1.5 million	Not known	US$ 1.5 million	US$ 1.0 million

Source: UNIDO, 2011b

The data presented in Table 21 was collected in 2010 when companies were starting to recover from the hyperinflationary environment and capacity utilisation tells the story of public health systems' ability to procure locally manufactured drugs. The last row in Table 21 underscores the importance of accessing long-term (foreign currency) loans to import machinery and equipment. For the three companies that disclosed their equipment requirements, the total need for capital equipment is US$ 4 million, and when one contrasts this against the ZETRAF line of credit to recapitalise whole industry of US$ 70 million, it becomes apparent that challenges to access long-term finance in-country are daunting. Project finance as a technological capability to accelerate investment capability becomes even more relevant as local pharmaceutical companies look to external sources for capital investment finance (see section 5.5)

I toured one pharmaceutical manufacturing factory and observed the challenges faced with some of the old machinery operating at non-optimised rates, especially the encapsulation machine. The

machine should separate capsules automatically, followed by powder filling and closure. However, there were challenges of separation and denting of capsules. Both the automatic machine and semi-automatic machines were sourced from the same Indian supplier (Production Manager, 2011). The semi-automatic machine is more reliable compared to the automatic encapsulation machine depending on the state of the blend (ibid). The automatic machine can run 10 kg per hour (range is 8.5 to 10 Kg), almost the same productivity as the semi-automatic encapsulation machine, a situation the Production Manager described as " typical inefficiency", because the idea was the automatic machine would produce 40 000 capsules per hour but it is currently operating at about 66% of that capacity (ibid).

To reinforce issues of efficiencies, the Production Manager remarked as follows giving an example of the encapsulation process and the challenges emanating from aged machinery:

> "Sometimes they [encapsulation machines] are slow and there are frequent breakdowns... basically these machines are now old and they break down frequently and they are not as efficient as they should be hence the need for financing to import new machinery" (Production Manager, 2011).

This particular company, as mentioned earlier has two encapsulation machines, both sourced from India. The automatic machine (10 years old) has not been efficient, ever since it came (ibid). The other semi-automatic encapsulation machine (14 years old) requires manual intervention and is therefore labour intensive. Importation of the automatic encapsulation machine was supposed to result in higher efficiencies and less manual intervention, however this has not materialised, as run rates are almost the same for both machines (ibid). The inefficiencies result in longer processing times translating to higher production costs. The company has to run two shifts where one would have been sufficient as illustrated in the quote below:

> "When I am talking of efficiencies I am talking of the rate at which they [encapsulation machine] are going to convert the blend into capsules, per

hour. The semi-automatic machine can convert 7.5 Kg per hour..... a batch size will be 300Kg for ARVs....other products batch sizes of 500Kg or 480 Kg. So you can imagine.....Stavudine it will take you 40 hours to finish the batch. So you need 2 by 24 hour shifts" (Production Manager, 2011).

A replacement semi-automatic encapsulation machine would cost USD 250K, and a replacement automatic encapsulation machine ranges from USD 400 K to USD 1 million depending on the make and supplier (ibid). With the current lack of long term finance, low demand for products, importing more technologically advanced and higher efficiency machines is unattainable, leading to higher manufacturing costs, high rates of spoilage and wastage. This results in price uncompetitiveness at tenders against foreign pharmaceutical manufacturers with higher efficiencies, more advanced machinery and economies of scale (ibid). The implications on technological capability upgrading becomes apparent, as local companies have to perpetually play catch up with current ARV technology. The absence of local capital goods manufacturers or fabricators makes technological catch-up highly dependent on technology imports and hence foreign currency long term loans which leads to the need for project finance skills.

I turn to project finance in the next section.

5.5 Project Finance Capability: They Could Have Looked Outside for Long-Term Finance.

In as much as Zimbabwean pharmaceutical companies could not access long-term finance (foreign currency) in Zimbabwe they could have looked for finance outside as other enterprises did. Table 22 reveals medium-term loans (foreign currency) that Zimbabwean enterprises right through the hyperinflation era obtained from PTA Bank (Eastern and Southern African Trade and Development Bank; see section 2.3). Table 23 reinforces the above arguments as it shows that pharmaceutical companies from Uganda, Kenya and Malawi sought finance outside their borders. This inability to

access finance from outside Zimbabwe points to issues of capacity and capability for project finance proposal synthesis and aggressively approaching possible funders by casting the net wide. A banking executive remarked that regional financial institutions could finance local companies and if they did not approach them then there was an issue with the pharmaceutical companies as reflected in this quote:

> "Yes, there is no liquidity in the country at the moment. So it's only regional banks that are coming in like, PTA and AfDB. Those are the ones that can finance them.... if they [pharmaceutical companies] are not aware it means they are living in some world. A number of investment conferences have taken place and anyone who had a need for medium and long term finance would in my view have been talking to any of these institutions" (Executive Director, International Bank A, 2011).

A pharmaceutical industry consultant was downright categorical and scathing in his attack when explaining the inability of the industry to look for long term finance outside Zimbabwe as reflected in this remark:

> "...*vanotya ava* [they are scared] to go and talk to the regional banks because they know they will be asked for a project proposal and they don't know how to do it....money is out there and people must be able to do a proper industrial project proposal." (Consultant, Pharmaceutical Industry, 2011).

The first part of the quote was said in the Shona vernacular language, and usually in a discussion when someone wants to emphasise a point they resort to the vernacular so that the meaning is not lost in translation. In this case, "they are scared" reiterates the allegation that because the pharmaceutical companies cannot produce robust project finance documents they would rather not approaching regional banks. The quote above demonstrates the importance of project finance as a technological capability that links into investment capability (see section 3.6). As I argued, project finance capability is the missing link in Lall's (1992) firm level technological capabilities. The second issue that is brought to the surface is the importance of skills (know-how) (Ernst and Lundvall, 1997) in accessing long term loans manifesting as proficiency in investment capability

and linking it with project finance capability to access the financial resources required for physical investment. Lall (1992) had pointed out the importance of garnering financial resources on the back of an efficient financial system. However, as argued earlier and seen in section 5.4 the financial systems are not efficient to raise the resources required to import plant, equipment and machinery.

On following up with the pharmaceutical company executives and asking them if they had approached regional banks; they all acknowledged that they had not. Some of them were not aware that Zimbabwean companies had accessed medium term loans from regional banks. One pharmaceutical company argued that they had not bothered to look for medium and long term finance for purely strategic reasons. They did not want to borrow when other fundamentals were not in place. The pharmaceutical company executives were only aware of the Zimbabwean driven long term financing initiatives involving Afreximbank and the Government of Botswana, but not regional bank initiatives. This reflects Ernst and Lundvall's (1997) knowing and learning aspects of innovation and lack of linkage capability with key finance providers in the country and in the region (Lall, 1992). The finance function has challenges pertaining to project finance capability know-how, know-why, know-whom critical for accessing finance for technological capability upgrading. What is paradoxical is that some Zimbabwean companies with project finance capability approached PTA bank and obtained medium term finance (see Table 22), and there are other African pharmaceutical companies that approached PTA bank and were financed (see Table 23). According to bankers, the pharmaceutical companies need to strengthen their project finance skills, project proposal synthesis and writing skills, as illustrated in the remark below:

> "The other problem also I think in these [pharmaceutical] manufacturing entities is that they are not using people who know project finance to be able to package their deals into bankable propositions. They [pharmaceutical companies] must also go to financial advisors, people who understand project finance, who will be able to interrogate them upfront before they go to banks. When you are proposing this what are the financial implications? Because some of the things

they start discovering is when the bank starts asking questions. And they say "*ahhh I am not quite sure what the financial implications would be*" [emphasis added]" (Executive Director, International Bank C, 2011).

Table 22: Term loans to Zimbabwean enterprises from PTA Bank.

Term Loans To Zimbabwean Enterprises from PTA Bank			
Year	Recipient	Loan Amount: US$ Million	Purpose
2005	Pioneer Corporation Pvt. Ltd.	6	Exapnd capacity. 28 Haulage Trucks and 33 trailers.
2006	Surface Investments Pvt. Ltd.	2.5	Set up an oil seed processing complex to manufacture edible oil and animal feed ingredients. Finance part if machinery and equipment.
2006	Rainbow Tourism Group	1.85	Procurement of equipment, vehicles, and furniture and fittings for establishment of 3 Star hotel in Beitbridge.
2007	RIOZIM Ltd.	3.31	Commissioning an open cast gold mine in Kadoma.
2007	New Donnington Farm	1	Procurement of broiler slaughter equipment and refridgerated trucks for distribution.
2007	Tanganda Tea Company Ltd.	1.676	Purchasing of plucking machines, tractors, other farm equipment and motor vehicles.
2008	ARIPO (African Regional Intellectual Property Organisation)	1.1	Construct 12 room guest house to accommodate participants/students attending its courses.
2008	Rainbow Tourism Group	3.2	Part finance upgrade of A'Zambezi Lodge from 3 Star to 4 Star.
2009	Star Africa Corporation Ltd.	3	Finance renewal of the company's haulage capacity through acquisition of 20 new horses.
2009	Eastern Highlands Plantations Ltd.	1.83	Purchase of mechanical plucking machines, tractors,other farm equipment and motor vehicles.
2009	Tarcon Pvt. Ltd.	6	Purchase of earthmoving equipment for civil and road construction.

Source: PTA Bank Financial Statements, 2005-2009.

Table 23: Term loans to Kenyan, Malawian and Ugandan pharmaceutical enterprises from PTA Bank between 2005 and 2008.

Term Loans To African Pharmaceutical Enterprises From PTA Bank			
Year	Recipient	Loan Amount: US$ Million	Loan Purpose
2005	Kisakye Industries Limited: Uganda	1.67	Procurement and installation of new machienry and equipment, furniture and fittings to manufacture pharmaceutical products in capsule, tablet and liquid form.
2005	Palm Healthcare International Limited: Kenya	1.8	Finance procurement of machinery and equipment for the establishment of a condoms manufacturing plant in Nairobi.
2006	Maria Assumpta Pharmaceuticals Limited: Uganda	2.385	Part finance procurement of machinery, equipment, furniture and fittings for clinical absorbent cotton wool manufacturing plant in Kampala.
2006	Abacaus Parenteral Drugs Limited: Uganda	8.53	Part finance establishment of an ultra modern blow-fill seal plant to manufacture intravenous fluids and vials for water injections.
2008	SADM Pharmaceuticals Limited: Malawi	2.2125	Importation and installation of new equipment and machinery to complete the rehabilitation and expansion of a pharmaceutical manufacturing factory in Lilongwe.

Source: PTA Bank Financial Statements, 2005-2009.

Another banker reinforced this perception by suggesting that pharmaceutical companies should employ qualified finance personnel with the requisite project finance capability as illustrated below:

> "You need a specialist person who would now be working with various projects, possibly a CA [chartered accountant] and pay him well so that he commits himself to whatever is happening. But if you pick someone from the road and say you are the accountant, yes he has got experience, but you are not taking what the business requires." (Senior Manager, International Bank D, 2011).

To reinforce the lack of project finance capability in the industry, a pharmaceutical consultant gave remarked as follows:

> "We have been working with a group right now, they want to do a recapitalisation and its now going 6 months and I have not seen any

documentation for that project feasibility that they want to do. So do you think competition waits for you or the financiers wait for you, saying this company will come, no they don't". (Consultant Pharmaceutical Industry, 2011).

The above examples reveal the extent of lack of project finance capability, a key technological capability input for companies intending to synthesise robust project finance proposals that can be funded. The Zimbabwean Public Accounting and Auditing Board have identified the finance skills challenge. Sponsored by the local World Bank office, they brought together universities, professional accounting bodies, and senior finance executives in industry to map a way forward, to improve accounting and finance training in the country. What emerged in the meeting was that the quality of finance and accounting graduates was low[19]. The graduates had to enrol with South African universities after completing their studies at Zimbabwean universities in order to be admitted into professional bodies, a situation that local professionals find untenable.

5.6 Markets for Drugs: Sales and Distribution

Customers for ARVs are mainly the Government through the National Aids Council (NAC), local and international NGOs, mission hospitals and clinics, and for export customers such as CMS (Marketing Manager, 2011). The private sector customer base is made up of pharmacies, private hospitals, health insurance firms, corporate clinics, estates, plantations, and mines who buy on credit terms, further stretching pharmaceutical companies' cash flow (ibid). The customers are spread mainly in the following centres; Hwange, Victoria Falls, Mutare, Chirimuhanzu, Bulawayo, and Harare. Distribution is done through pharmacies and hospitals, and the company serves the markets through Sales Representatives, who look after retail pharmacies, dispensing doctors, hospitals, dispensing clinics, NGOs and industrial clinics. For tenders there is a Manager responsible for monitoring press adverts and international tenders, especially after they attained

[19] The meeting held in Harare in 2011, discussed the challenges faced by companies in accounting and finance skills and involved universities, professional accounting bodies and industry finance executives. The purpose was to develop a road map of building capacity in accounting and finance by involving qualified accountants and finance executives in the training programmes.

WHO prequalification. The company is registered with the UN agencies UNICEF, UNDP, and UNOPS that relay information on floated tenders (ibid).

WHO pre-qualification began to pay off for the company almost one year after certification. In September 2011 there was a UNICEF order for 155 000 units of Stalanev for the local market and 6 000 units of Lamuvidine/Zidovudine for South Sudan. All these orders at an ex-factory price of about US8 meant total sales estimates are approximately US$ 1.3 million. The company also won a 24 months contract to supply South Africa 125 000 units of Stavudine per month. However, the margins are thin signifying the commodity nature of generics compared to patented drugs, which bring in huge profits because of exclusivity. The company is moving towards a regional thrust and tapping into the international market leveraging their WHO prequalification. Currently the regional target countries are Zambia, Malawi, Lesotho, Swaziland, Mozambique, Namibia, Cameroon, Tanzania, DR Congo and Kenya. The main customer for ARVs however, remains the National Aids Council which procures for the HIV/AIDS programme using the AIDS levy as a funding mechanism as captured in the remark below:

> "NAC [National Aids Council] take the biggest chunk of total ARV sales, about 80 to 90%, because what goes into the private market if we are talking of private market we are talking about what goes into the pharmacies. Where you have to pay, and with the pharmacies the market is very small, one because Zimbabwe is already a very small country when we are talking about medicines and the capacity we have. And the volumes have to be on funding" (Procurement Manager, 2011).

The government gives local pharmaceutical companies a price preference of 10% on tenders. The terms for payment are 30 days, however there are incentives such as a 12% discount if customers pays in 7 days. Those who purchase high volumes on account are eligible for a 5% discount. Although the sales terms are 30 days from date of invoice, customers sometimes stretch payment terms to 60 days (Marketing Manager, 2011).

In terms of distribution, they use small vehicles (Mazda B1800) and a 7 tonne lorry. The 7 tonne lorry is used for big orders for Natpharm (Government purchases). The company keeps its

distribution costs low that way by delivering to Harare and Bulawayo and charging for transport costs except for government which does not pay for out of town deliveries. (Marketing and Sales Manager, 2011)

5.6.1 Competition

Ranbaxy, Cipla, Hetero, and Ipca are the main competitors against locally manufactured ARVs (ibid). Their competitive advantage is driven by vertical integration, economies of scale and a wider product range and most importantly, they produce latter generation ARVs not manufactured in Zimbabwe (See Table 10). Their ability to manufacture latter generation ARVs explains why their products were prevalent on displays by NGOs supporting antiretroviral treatment at the AIDS conference in Zimbabwe. Local manufacturers' competitive advantage over the international companies is proximity to regional centres and a general preference for locally manufactured products especially by professionals such as pharmacists and doctors (Marketing and Sales Manager, 2011). However for the large tenders that really matter, it is price that drives the process and the local companies have not done well (ibid). WHO prequalification, low distribution costs, and regional strategic alliances give a competitive advantage to local manufacturers as evidenced by supply tenders won for the South African market (ibid).

On local tenders though, the definition of local company, is a grey area that has caused controversy (ibid). The local companies, through the manufacturing association has lobbied for the definition to be clarified to mean a company locally manufacturing pharmaceutical products, domiciled and registered in Zimbabwe (ibid). This will help on who qualifies for the 10% price differential preference for local suppliers. Some international companies had taken advantage of the definition of local company loophole to register local representatives and then compete for tenders as local manufacturing entities; whilst importing finished products duty free (Marketing and Sales Manager, 2011; Marketing Director, 2011).

5.6.2 Prices and their determination

The margins on ARVs are reportedly very low and lie in the range 7-10%, and the company said it viewed ARVs as part of their corporate social responsibility, unlike retail pharmacists whose mark-ups are 50% or higher (Marketing and Sales Manager, 2011). For example the ex-factory price of Stalanev (a bottle of 60 tablets) is US$ 7.60, while retail pharmacists charge US$ 15 to US$ 20 plus a dispensing fee of US$1 (Marketing and Sales Manager, 2011). Table 24 shows some of the prices charged by retail pharmacies in Harare as at September 2011 compared to prices charged in 2008 (Table 25) according to Osewe *et al.*, (2008).

Factors considered in pricing ARVs include cost of production and the thrust of viewing ARVs as part of corporate social responsibility and not wanting to profiteer from them (Marketing Manager, 2011). The second aspect considered is affordability. The example of Stavudine given above where a margin of 7-10% is put on cost price is driven by the fact that the disposable income for Zimbabweans is very low and there is a need to make the medication affordable (ibid).

Table 24: Retail pharmacy prices for a select number of ARVs as at September 2011

ARV	Constituent Drugs	Retail Pharmacy Price USD (Sep 2011)
Stalanev (60 tablets)	Stavudine + Lamuvidine + Nevirapine	13
Aluvar (120 tablets)	Lopinavir + Ritonavir	80
Lamuvidine and Zidovudine (60 tablets)	Lamuvidine + Zidovudine	20
Tenolam (60 tablets)	Tenofovir + Lamuvidine	80
Nevirapine (60 tablets)*		12
Efavirenz (30 tablets)*		20

Table 25: Varichem ARV prices as at 2008.

Product	Pack Size	Initial Unit Price (US$)	Launch Date
Varivar (lamuvidine 150mg + Zidovudine 300mg)	60 Tablets	15.35	Jul-03
Stalanev (Stavudine 30/40mg + Nevirapine 200mg + Lamuvidine 150mg)	60 Tablets	12.80	Oct-03
Stavudine 30mg	60 Capsules	2.60	Jun-04
Stavudine 40mg	60 Capsules	3.10	Jun-04
Lamuvidine 150mg	60 Tablets	4.85	Jun-04
Nevirapine 200mg	60 Tablets	6.90	Sep-04
Zidovudine 300mg	60 Tablets	9.90	Mar-05
Indinavir 400mg	180 Tablets	69.10	Sep-05

Source: Osewe et al, 2008

5.7 Conclusion

The objective of this chapter was to present empirical evidence addressing research questions 1, 2 and 3. The key findings in the chapter are summarised in Table 26. Evidence from the data shows that capital investment for R&D and manufacturing is from internal sources. Companies leveraged tenders and exports to save foreign currency to purchase equipment on standby from India and China. The determinant of where to source machinery and equipment from is cost. Companies have to balance capital equipment procurement with other requirements since they do not have access to finance. Research question 2 was concerned with the role played by banks. .

Table 26: A summary of what was discussed in the chapter.

	Research and Development	Procurement of Raw Materials	Procument of Machinery and Equipment	Manufacturing	Sales
Activity	Formulation development, Bio studies and Registration	API, Excipient and Consumables	Machinery and Equipment for Factory and Laboratory	Conversion of raw materials into finished products	Sales and Debtors collections
Duration	2 Years	Up to 90 Days	Savings, up to 3 Years	30 Days	30 to 60 Days
Source of Funds	Own - internally generated	Borrowings / Internal	Own - internally generated	Borrowings / Internal	Borrowings / Internal
Choice	Forced to use internally generated funds because term finance not available.	Forced to pay upfront to suppliers using borrowed or internally generated funds. They finance their suppliers using borrowed funds.	Forced to save funds and sometimes pay on lay bye because term finance is not available.	Expensive short term finance available.	The market demands credit terms. The companies finance their buyer using borrowed funds.
Ideal Situation	Term finance or own internally generated funds if very profitable.	Credit terms of up to 90 days. Supplier finance reduces the amount of working capital requirement and interest costs.	Term finance using appropriate lending technologies; asset backed technologies.	Compare with India which gives concessionary finance to pharmaceutical industry.	Mixture of cash and terms but prompt collection of debtors reducing working capital requirements.
Dynamics at play	Liquidity crunch. Country risk. Financial architecture. Low national savings.	Liquidity crunch. Country and foreign currency risk; driven by historical foreign currency shortages and political instability.	Liquidity crunch. Country and foreign currency risk; driven by historical foreign currency shortages and political instability.	Liquidity crunch. Country risk. Financial architecture. Hot short term deposits.	Liquidity crunch. Buyers stretching suppliers and being financed cheaply compared to borrowing from banks.

It emerged that banks do not play a role in capital investment finance, but they finance working capital requirements, which pharmaceutical companies claim is expensive (see chapter 6). Trade credit an external source of in-kind finance is not available for the importation of APIs and excipients, key cost drivers in ARV manufacturing. Research question 3 sought to find out what the technological capabilities were for accessing finance at the pharmaceutical companies. Evidence shows that pharmaceutical companies have challenges in investment capability, especially the pre-investment capability and project finance capability. As a result they could not approach regional banks which other Zimbabwean enterprises did. Local pharmaceutical companies are failing to establish linkages with local research organisations to carry out bio-equivalence tests, a situation that limits technological capability upgrading, and does not promote backward linkages that result in industrial deepening. The biggest buyer of ARVs is NAC which is funded by the AIDS levy. However with the high unemployment rates in Zimbabwe its resources are limited and the majority of patients on ART are supported by NGOs and global health donors.

Chapter 6: Financing ARV Manufacture in Zimbabwe: The Role Played by Banks

"It is not from the benevolence of the butcher, the brewer or baker, that we expect our dinner, but from their regard to their own interest"

Adam Smith. Wealth of Nations, I, ii.2; 119

6.0 Introduction

The quotation above reflects and precipitates an interesting clash of motivations and objectives. Reflective of this conflict in motives is the situation between financiers and the financed enterprises. Financiers are motivated by minimising risk and ensuring repayment of loans issued. They do not engage in loan origination for the sake of it, but they anticipate adequate compensation for their endeavours. In chapter 5, I discussed sources of finance for working capital and capital investment for ARV manufacture and the role played by banks. I also discussed firm level technological capabilities required by pharmaceutical to access finance. The focus in chapter 5 was to address research questions 1, 2 and 3. In this chapter, I address research questions 1, 2, 3and 4 as detailed below to understand the role played by banks in availing working capital and capital investment finance. I also cover institutional factors that drive bank strategy on revenue streams, who to lend to and at what cost, in addition to the technical expertise and knowledge involved in loan origination, disbursement, and monitoring and control to unravel the complexities surrounding financing ARV manufacture.

Research question 1: How are capital investment and working capital requirements for ARV research and development, and manufacture financed?

Research question 2: As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?

Research question 3: At firm level, what technological capabilities are required for pharmaceutical companies to access finance and expertise and lending technologies for banks to assess project proposals and advance loans?

Research question 4: What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?

In addressing the research questions above, I discuss long-term finance, followed by working capital investment finance and the role that banks played in availing it. I set up the rest of the chapter as follows: In section 6.1, I discuss financing of local pharmaceutical manufacture, splitting the types of finance into long-term finance for capital investment and short-term finance for working capital requirements. In section 6.2, I discuss long-term finance for capital investment critical for importing technology whilst in section 6.3; I discuss short-term financing of working capital requirements. In section 6.4, I discuss how Zimbabwean commercial banks manage lending technologies and expertise required for loan origination, documentation, disbursement and monitoring and control. I turn to the politics of lending in section 6.5, and conclude the chapter with section 6.5.

6.1 Financing Local ARV Manufacture

To enable a structured discussion, I split financing of ARV manufacture into long-term and short-term finance. Caprio and Dermiguc-Kunt (1998) assert that increasing supply of long-term finance to industrial companies is a priority for developing countries as it can promote productivity and growth. I therefore focus on long-term finance because it is critical for capital investment and can accelerate technological capability upgrading (ibid). Short-term finance funds working capital

requirements of a company and the debt characteristically matures within one year unlike long-term finance, which can have maturities of up to 10 or 25 years or more depending on the project financed (Fazzari and Petersen, 1993).

Zimbabwean pharmaceutical companies did not access financing for ARV manufacturing as a special or separate project (Pharmaceutical Industry Consultant, 2011; Production Manager, 2011). Machinery and equipment used for ARV manufacturing is of universal functionality and can be used for other product lines as reflected the quote below (Production Manager, 2011):

> "For basic formulations they [machinery and equipment] are the same, but it depends on the, I mean with new ARVs like your new Calitra technology is totally different. It is going to depend on the drug". (Pharmaceutical Industry Consultant, 2011).

As the above quote reflects, only ARVs such as Calitra require specialised technology for manufacture. Thus, finance for ARV manufacturing was included in the financial package for the whole portfolio of drugs manufactured by the company. In the discussions that follow on financing of ARV manufacture in Zimbabwe, especially capital investment, I take this aspect into cognisance. However, for working capital finance for ARVs, it is possible to a certain extent to isolate raw materials and costing specific to ARV manufacture (see chapter 5) and thus tease out some aspects of working capital finance and trade credit as was demonstrated in section 5.2.

Commercial bankers also confirmed that they did not finance ARV manufacture as a separate project as reflected in the two quotes below:

> "We didn't lend specifically for ARV projects. But we financed the companies' working capital requirements. However you never know whether during the Zimbabwe Dollar era whether the companies took working capital loans and

used them for recapitalisation of their operations" (Senior Manager, International Bank B, 2011).

"We did not fund ARV manufacturing projects specifically, but financed general working capital requirements for the pharmaceutical companies. Companies have a tendency of taking loans for working capital and use them to recapitalise their operations resulting in mismatch of assets and liabilities." (Executive Director, Domestic Bank C, 2011).

The allegation by the bankers that companies have a tendency to borrow for working capital and use the loans to capitalise their operations is difficult to test without access to pharmaceutical company financial statements, although it points to moral hazard. With access to financial statements, one can ascertain a financing mismatch by scrutinising the debt structure of the company. If long-term assets are financed by short-term finance, there is a financing mismatch and the company will eventually run into cashflow problems. Long-term assets should be funded by long-term liabilities or loans, however the core working capital portion of working capital, should be financed by long-term liabilities[20]. What the allegations by the bankers surface are that moral hazard could be pervasive amongst some Zimbabwean enterprises. If companies obtained short term finance and used it for long term projects then this presents a mismatch and the risk profiles for which the funds were given and for which they were applied to are inherently different; a clear example of moral hazard manifesting in diversion of funds to a different project.

The discussions in sections 6.2 and 6.3 therefore address specifically long term financing of capital investment and short term financing of working capital requirements respectively. A general analysis of the availability of short, medium and long-term finance in Zimbabwe is represented in Table 27, which reveals that short-term finance has been the dominant mode of finance available to the pharmaceutical sector from 2000 to date (see section 6.3).

[20] This knowledge emanates from the training of the researcher as a commercial lender.

Table 27: Availability of short, medium and long term finance between 2000 and 2011.

Commercial Bank Loans To Pharmaceutical Companies In The Period 2000 to Date				
	2000 to 2005	**2006 to 2009**	**2009 to 2010**	**Post 2011**
Short Term Finance	Facility Availed	Facility Availed	Facility Availed	Facility Availed
Medium Term Finance	No Facility	No Facility	No Facility	Possible Facility Through ZETRAF, or Botswana-Zimbabwe Government to Government Deal.
Long Term Finance	No Facility	No Facility	No Facility	Possible Facility Through ZETRAF, or Botswana-Zimbabwe Government to Government Deal.
Non-Bank Sources of Long Term Finance For Pharmaceutical Companies				
• Varichem got a loan of $ 2.1 million from UNDP which they used to upgrade their factory in 2007.				
• CAPS Pharmaceuticals was reported to have used $12 million for retooling their factory, source of funds is not known to researcher. However in 2008 Fredex Financial Services, a company controlled by a major shareholder of the group advanced USD 4 milli				
• Another company spend USD 1.3 million from own resources upgrading their facilities.				

Source: Interviews with Pharmaceutical and Bank Directors, Credit Approvers, 2011; CAPS Financial Statements.

In the next section, I turn to the issue of long-term finance and capital investment for importation of machinery and equipment (the hardware of technology).

6.2 Long Term Finance for Capital Investment

Pharmaceutical companies, as mentioned earlier, did not access medium or long-term finance from local, regional or international banks in the last decade (Managing Director 1, 2011; Managing Director 2, 2011; Marketing Director, 2011). Varichem and CAPS accessed finance from UNDP and Fredex Financial Services respectively (Consultant, Pharmaceutical Industry, 2011; CAPS Financial Statements, 2008, 2009, 2010; UNIDO 2011b). Varichem obtained a loan for US$ 2.1 million from UNDP, which was used to upgrade their factory culminating in WHO pre-qualification (Consultant Pharmaceutical Industry, 2011). UNDP stepped in as a broker to alleviate

shortage of foreign currency in Zimbabwe to increase the chances of technological capability upgrading to enable Varichem to compete in international tenders. CAPS on the other hand leveraged cross ownership of Fredex Financial Services by their Executive Chairman to get shareholder loans to retool their factory (CAPS Financial Statements, 2008, 2009, 2010). Table 28 shows CAPS loans and shareholder funds for the period 2004 to 2010. Shareholder loans peaked at USD 4.3 million in 2009. What is of concern with the financials is the sudden increase of short-term debt in 2010 of USD 5.87 million when the market for drugs was subdued. I will discuss this in section 6.3, under short-term finance; suffice to say CAPS ran into challenges with this expensive short-term debt.

An interesting source of long-term finance; venture capital was used to set up Plus 5 Pharmaceuticals (UNIDO, 2011b). The Venture Capital Company of Zimbabwe funded the establishment of Plus 5 Pharmaceutical Company and sold off its stake after 5 years in 2001 to two directors (ibid). Venture capital, has however not been active for more than a decade for the same reasons advanced earlier in chapter 2 of an unstable and unpredictable macroeconomic and political environment accompanied by sudden policy changes (Managing Director, Project Finance Company for Mining Sector, 2011).

Table 28: Short term and long-term borrowings for CAPS Pharmaceuticals for the period 2004 to 2010.

Loan Outsandings in US$ as at 31 December of Each Financial Year							
	2004	2005	2006	2007	2008	2009	2010
Short Term Loans	985k	40k	38k	214k	214k	-	5.9m
Interest Bearing Non-Current Borrowings	45k	9k	73k	27k	14k	93k	62k
Shareholder Loans	-	-	163k	2.9m	4.1m	4.3m	3.2m
* Borrowings of $ 5.9 million in 2010, under short term loans are for 12 months and from 5 Commercial Banks at a weighted average Interest rate of 20-30%							

Source: CAPS Holdings Financial Statements; 2006, 2007, 2008, 2009 and 2010

Table 29: Long-term loans sought by Pharmaceutical companies as at September 2011.

	Long Term Finance Facilities Under Consideration As At September 2011			
Pharmaceutical Company	Amount Sought	Tenor Of Facility	Source of Funds	Borrowing cause
Company A: Application Being Considered by Bank E	$ 1 million	5 Year Facility	ZETRAF: Afreximbank - Zimbabwe US$ 70m facility	Machinery and equipment purchase.
Company B Applications Being Considered by Bank E	$ 1 million	5 Year Facility	Botswana-Zimbabwe $ 70m facility	Purchase of Specialised Spraying Machine, R&D Small-scale production equipment and Laboratory equipment.
Company B Applications Being Considered by Bank E and F	$ 150K	2 Year Facility	Local Facility	Laboratory and R&D equipment.
Company B: New Factory Construction, facility sought	$ 5 - 15 million	Up to 15 Years	Not Yet Identified	Factory construction and re-tooling as per WHO cGMP standards.
Company C: Facility sought	$ 5 million	Up to 6 or 7 Years	Not Yet Identified	Factory Upgrade to WHO cGMP standards, and upgrade dormant manufacturing line which needs technology upgrade.

Source UNIDO 2011b and field work in Zimbabwe.

The pharmaceutical companies could not access long term loans to import plant, equipment and machinery. They depended on internally generated funds to procure the required capital goods (see

chapter 5). Pharmaceutical company executives acknowledged that this is a slow way to encourage technological effort. Table 29 above shows long-term loan requirements for pharmaceutical companies in Zimbabwe. The reality on the ground though is that Zimbabwe does not have long-term savings, to finance these long-term loans. A corporate banker raised this issue in the remark below:

> "...you need to understand the Zimbabwean economy as it stands now, the problem in the economy is that there is no long-term money. In other words what this economy needs are credit lines [offshore] which are long term and reasonably priced." (Head of Corporate Banking, Domestic Bank C, 2011).

This makes the maturity and liquidity transformation functions of financial intermediaries difficult if there are no deposits to support the lending. Another banking executive emphasised the link between long-term loans, long-term savings and a vibrant domestic savings market as follows:

> "I am participating in this vision 2040 and this US$ 100 billion economy and I sing the same song. You cannot grow; no nation has ever grown without its own domestic savings. I keep saying those things. So 25% must be saved. To me whether it is forced saving or natural savings on the part of individuals or companies, we really need to plough back a lot of money into our businesses. So savings: 25% of GDP. Once we save, only then can we invest." (Group CEO, Domestic Bank E, 2011).

The two quotes surface an interim and long-term solution to long-term loans. The first quotation talks of the establishment of offshore loans, acknowledging the lack of domestic savings and foreign currency reserves to support importation of technology. In the current macroeconomic environment characterised by limited international capital inflows and little national savings, regional banks remain the most probable source of finance for industrial growth as reiterated repeatedly by bankers. There is however, a risk premium that money coming into Zimbabwe attracts "the Zimbabwe risk premium" as described by one banker as the risk emanating from politics (Group CEO, Domestic Bank F, 2011). The same politics drives sentiment that repels FDI,

and with the current furore around indigenisation, FDI will to continue to be a difficult proposal for technology transfer and technological capability upgrading (see chapter 7).

The second quote focuses on national savings of 25% of GDP, but this is a long term objective, that does not escape the critique of Dailami and Walton (1989) that what Zimbabwe needs are foreign currency loans as saving domestic resources do not help with importation of capital goods which the country does not manufacture[21]. The situation may be clouded now after adoption of the multicurrency regime. However Zimbabwe needs to earn foreign currency to build up its reserves to enable the importation of plant, equipment and machinery. This challenge will inevitably resurface when the country reverts to a local currency.

6.2.1 Why no long term finance?

Turning to why there are no long-term loans, commercial banks argue that it is difficult to advance long-term loans in Zimbabwe under the current unpredictable political and macroeconomic environment. A Chief Risk officer with an international bank explained why they are not lending long term as follows:

> "With us it's not lack of liquidity but the country risk. Would you want to lock yourself for 2 to 3 years when you don't know what will happen tomorrow? I think that is the issue, so it is not liquidity per se." (Chief Risk Officer, International Bank, May 2011).

This quote reinforces the politics argument advanced by one banker, and points to the need for a stable macroeconomic and political environment in the country for long term lending to occur. However, this outlook is flawed in that this bank has not attracted long term deposits to be able to lend long term. The magnitude of risk, maturity and liquidity transformation they would need to engage in would not be possible especially considering that they are currently attracting hot

[21] I am aware that macroeconomists argue that a rise in domestic savings all things being equal will lead to an increase in the chances of accessing foreign currency. However, the local currencies are not freely convertible either regionally or internationally and as such trade plays a key role in generating sources of foreign currency.

deposits. However, to underscore the requirement for long-term political and macroeconomic stability and predictability as a trigger for long term loans an Executive Director with an international bank remarked as follows:

> "Maybe the other problem also which could be there is some measure of uncertainty this side of the globe, ...when you say to yourself what will the situation be like in the next 6 months, you don't know. And if you are asked to put probabilities to it, then a lot of things lie between 0 and 1 and you don't want a situation where you won't be able to put a marker because decision making requires you being able to put a marker on the probability of an event happening. The risk is on the high side." (Executive Director, International Bank C, 2011).

Policy predictability and long-term policy announcement giving industry and commerce adequate time to plan prepare and execute strategies that ensure viability thus emerges as one of the arguments why commercial banks are not lending long term. This, however is a secondary issue as the primary driving force is the availability of the right type of savings for importing capital goods (Dailami and Walton, 1989). I return to the discussion of external factors in Chapter 7 when I focus on the business and operating environment.

An executive director with an international bank argued that for as long as country risk, macroeconomic stability, political stability and policy predictability are not addressed, they run a real risk when politics changes as reflected in the quote below:

> "So in the event that argument [country risk, policy, macroeconomic and political stability and predictability] is accepted then we can start raising deposits on a medium term and long term basis, so that we can start lending to clients, but in the meantime most of these clients will have to rely on regional banks, African Development Bank, PTA Bank, Afreximbank and DBSA. Those have been coming to the party." (Executive Director, International Bank A, 2011)

This quote confirms a general reluctance to lend long term by foreign owned Zimbabwean banks (international banks) for as long as macroeconomic and political stability and predictability are not restored. The argument I advanced earlier that this assertion that when the macroeconomics are right they can lend is not solid. The country or the banks do not have the long term savings that the financial intermediaries can subject to maturity and liquidity transformation. The question that arises then is, are the bankers conversant with the underlying principles of financial intermediation or they are just seeing the immediate problem of unstable macroeconomics without giving due regard to the fundamentals of the role of financial intermediaries (see section 3.5). If the country does not have the medium and long term deposits, it raises the question; which resources will they mediate? One possible explanation especially for the international banks could be that they depend on their extensive network to raise term finance, but this would be subject to country, credit and foreign currency risk when the country reverts to local currency. What is paradoxical though is that they point to regional developmental financial institutions such as AfDB, PTA Bank and DBSA as the financial institutions that Zimbabwean industry can rely on for long-term finance, without considering that these institutions take care to match the maturity of their liabilities (deposits) and assets (loans advanced).

Domestic banks argue that liquidity and non-availability of funds was the major drawback on their ability to issue long-term loans (Group Chief Executive, Domestic Bank F, 2011; Executive Director, Domestic Bank A, 2011). Domestic banks thus have a different perspective to international banks on reasons for not lending long term. The argument of domestic banks seems to be more in line with financial intermediation theory. Domestic banks also argue that their perception of risk is different to international banks as they are on the ground and know the Zimbabwe risk better (Head of Corporate Bank, Domestic Bank C, 2011). They therefore do not shy away from raising long term deposits as evidenced by a domestic bank that tried twice to raise funds on the local market with poor results though. Asked how much they had raised, an executive responded thus:

> "We floated a US$ 7 million paper and the second one we went for US$30 million. Oh it's very little [what we have managed to raise], when we went for US$30 million, it's not so long, we are still in the market for it, I think between the two papers we have got about US$5.6 million. The second one I think we are just over US$3.6 million I think. That's how low it is." (Head of Corporate Banking, Domestic Bank A, 2011)

In as much as domestic banks may have a different perspective on their understanding of risk compared to the international banks, the perception and response from the general investing public seems to reflect the international banks' perspective on an unstable macroeconomic environment driving a tempered appetite for long term risk.

The absence of long-term loans, according to the evidence, is caused by lack of domestic savings, the inability to set up offshore lines of credit by banks and the unstable macroeconomic and political environment. The regional banks, which seem to have a different perception of the Zimbabwe risk, are the ones, which have been providing long-term loans (foreign currency) to the local industry.

I now turn to the loss of skills in long term finance due to the demise of merchant banks.

6.2.2 The disappearing merchant banks, loss of skills and technological capability

The demise of merchant banks was fingered in the loss of skills in long term finance and project proposal appraisal capabilities. As the financial architecture morphed, there was an exodus of skilled personnel to other countries combined with attrition of skilled resources in project finance and long term lending. One Senior Manager expressed frustration at challenges they faced with any form of medium or long-term project finance skills as follows:

> "It was a huge challenge [long term finance skills] in fact in the bank I worked for there was no skills at all for project appraisal; big projects - there was none." (Senior Manager, Domestic Bank E, with over 25 years' experience in an International Bank A April 2011)

A group CEO of a domestic bank acknowledged the attrition and scarcity of skills on project finance and long term lending skills but expressed hope that people can be found and attracted back to Zimbabwe or trained as reflected in the remark below:

> "I think the people [merchant bankers, finance house and discount house professionals] are dead, the people are overseas, people come back, you know people can be found, people can be trained." (Group CEO, Domestic Bank D, 2011).

Currently the challenge of lack of experienced bankers with long term financing skills is being felt as banks appraise project finance proposals for recapitalisation using the Zimbabwe Economic Trade and Revival Fund (ZETRAF) (see section 6.2.3 below). In a discussion, one executive for a domestic bank said he was looking for "old-time bankers" who knew how to structure long-term facilities and monitor and control them, but was having a hard time locating them. This brings out Ernst and Lundvall's (1997) know-how, know-what and know-why aspect of innovation and technological capability. The term "old timers" brings to mind Lave and Wenger's (1991) argument on the need for old timers to teach youngsters through an apprenticeship type of knowledge transfer because of tacitness of certain aspects of knowledge and learning cognisant of Polanyi's (1966) 'we know more than we can tell' aspect of knowledge and how important it is to learn by doing. Reflecting this analysis, the Head of Corporate banking for one bank, said skills were scarce on the market and trying to train young recruits was difficult, as they had never lived in an environment of long-term finance (Head of Corporate Bank, Domestic Bank D, 2011). Thus the looking for old time bankers quote reflects loss of old timers working as apprentice trainers passing on knowledge by doing; loss of tacit knowledge, and institutional memory, know-how, know-who and know-why all key elements to fostering and improving technological capabilities in financing long term finance projects based on the argument that we know more than we can tell (Lave and

Wenger, 1991; Ernst and Lundvall, 1998; Polanyi, 1966). The international banks however, claimed that they had an advantage as they can seek assistance from regional project finance teams anywhere in their group (Executive Director, International Bank A, 2011; Senior Manager, Organisational Learning, International Bank A, 2011).

The learning and knowledge aspects described above exacerbate the lack of firm level technological capabilities of project finance and complexities surrounding financing ARV manufacture. Zimbabwe thus faces an uphill task in generating the momentum and experience to finance technological capability, industrial development and innovation if efforts are not made to bring back the skills and knowledge required for long-term finance.

6.2.3 Current long-term finance initiatives in Zimbabwe

It is estimated that Zimbabwe needs USD 5 billion to recapitalise industry (MTDP, 2010). The Industrial Development Policy (2010) mulled the setting up of an Industrial Development Bank to finance industrial development, however this seems like a long term project that economists in the country feel is misplaced at this juncture (Development Economist, Economic Think Tank, 2011). In as much as the setting up of an Industrial Development Bank (IDB) is a noble idea, the preceding discussions point to lack of financial resources to lend and also lack of knowledge and skills. One key issue then for the IDB is who will capitalise it to such an extent that it can make a significant impact on long term financing of industry. Currently, government is failing to capitalise the Infrastructure development bank. If the local financial institutions are struggling in attracting the right skills with the know-how, know-what and know-why, where will the IDB get its human capital from and how will they manage to retain them where other financial institutions have failed?

The facilities that are accessible to the pharmaceutical industry and manufacturing industry at large are the ZETRAF and Zimbabwe-Botswana loan facility. ZETRAF is an institutional arrangement innovation between the regional bank Afreximbank and Ministry of Finance which on-lends funds to participating local commercial banks. The local banks analyse risk, disburse the funds, monitor and control the loans for recapitalisation (Executive Director, Domestic Bank A, 2011). Afreximbank put forward USD 50 million and the Ministry of Finance USD 20 million (ibid). In the first tranche, four banks; BancABC, FBC, NMB and TN Bank are participating, and the second tranche will be announced in the future and banks in the first tranche can participate in the second tranche (Executive Director, Domestic Bank A, 2011). Average loan sizes range from USD 75 000 to USD 2 million depending on the local bank disbursing the facility (ibid). One condition for the facility is that the local company should demonstrate 40% value addition to products manufactured (ibid). Interest rates for ZETRAF range from 13.3% p.a. to 15%, broken down as follows: cost of funds to the commercial banks is 8.3%, and the commercial banks load an interest margin of 5% to 6.7% making the total cost 13.3% to 15% per annum to the borrowing customer (ibid).

Afreximbank, aside from the ZETRAF fund, can also directly fund green field projects with a minimum loan amount of US$ 3 million and maximum US$ 80 million and tenor of 5 to 7 years (Senior Manager, Regional Bank, 2011). Generally, Afreximbank offers lines of trading to banks on the back of debt (bonds) raised on the international market. Afreximbank thus acts as an integrator linking two markets that ordinarily would not connect; international capital markets and local enterprises (ibid). Afreximbank takes country risk, credit risk and foreign currency risks inherent in Africa and assuages the discomfort with "Africa" risk by international investors (ibid). The phenomenon of regional banks acting as a broker and integrator in allocating resources acquired elsewhere that the country could not ordinarily access, brings to the fore the issue of institutional innovation at play reminiscent of product development partnerships in global health technologies (Chataway *et al.*,2010).

A second facility is the Botswana-Zimbabwe government-to-government deal for US$ 70 million with interest rates of 10% per annum although Botswana banks were hinting at 15% per annum (Managing Director 1, 2011). The facility has not been taken up and the problem with the facility is that Zimbabwean enterprises have to deal through Botswana companies, so that Botswana benefits too (ibid).

On seeking to understand why ZETRAF was sponsored by African regional banks and not local or international banks, an executive director with an international bank said African regional banks looked at the Zimbabwe risk differently compared to international banks because of their shareholding structure:

> "If you look at PTA and Afreximbank, you need to ask: who are the owners of those banks?"(Executive Director, International Bank B, August 2011).

An analysis of the shareholding of Afeximbank showed that nineteen State members own it. Seventeen are members from the Eastern and Southern Africa region with the non-regional member being China and an Institutional member the African Development Bank (AfDB). Regional members' shareholding is cumulatively 87.71% and the non-regional shareholders have 6.53% shareholding whilst AfDB has 5.76% shareholding (ibid). African country membership comprises of Burundi, Comoros, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Malawi, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Tanzania, Uganda, Zambia and Zimbabwe (ibid). The shareholding of Afreximbank (Table 30) bears testimony to the assertion by the Executive Director and Senior Manager of a regional bank (see quote below) that they support African enterprises because their shareholding and genesis was based on Africa needing financiers who would support enterprises when other financiers pulled out.

Table 30: The shareholding structure of Afreximbank

Type of Shares	Shareholders in the Class	% Shareholding	Shareholding Amount
Class A	African Governments, Central Banks, African Regional and Sub-regional Institutions	35	US$ 262.5 m
Class B	African Private Investors and Financial Institutions.	40	US$ 300 m
Class C	Non-African Financial Institutions, Export Credit Agencies and Private Investors.	25	US$ 187.5 m

Source:http://afreximbank.com/afrexim/en/OurProfile/ShareholdingStructureShareholders.aspx (accessed 8 /02/2012).

The different perspective to regional banks' appetite for Africa risk is reflected in the remark below:

> "As a regional multilateral bank owned predominantly by member states we were formed to fill the gap that arises when international banks move out of Africa. So we are essentially fulfilling our mandate [when we finance Zimbabwean industry]. The bank was formed during the 80s, I mean the concept during the financial crises of the 80s and what was discovered then is that whenever there is a financial crisis the international banks will go back to their jurisdictions to sort out their balance sheets in their countries, and they leave Africa with no money. Why? Because Africa is considered to be a high risk place" (Senior Manager, Regional Bank, 2011).

This assertion gives credence to the argument that for now companies should go to regional development financial institutions in section 6.2.1, and also that they support African enterprises because the shareholders are African governments, with central governors sitting on the boards. This finding is important as it points to an institutional innovation approach to financing African trade and industrial development being spearheaded by Afreximbank in Zimbabwe. A question for

future research is; can this approach provide a viable and sustainable option for accelerating technological capability upgrading?

6.3 Short Term Financing of Working Capital Requirements

As mentioned earlier, working capital finance for ARV manufacture was included in general working capital requirements (section 6.1). In this chapter, I discuss access to working capital finance for pharmaceutical companies in general and for the company manufacturing ARVs specifically. The short-term finance market is characterised by illiquidity, hot deposits and minimal savings as the country recovers from hyperinflation, as national savings were wiped away by hyperinflation (Executive Director, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011; Senior Manager, International Bank B, 2011). Lending in short-term finance market is through overdrafts, guarantees, short-term loans, bankers' acceptances, letters of credit, order finance, and structured trade finance (Executive Director, International Bank A, 2011; Executive Director, International Bank B, 2011). Of these products, overdrafts and short-term loans are the most dominant (Executive Director, International Bank A, 2011; Executive Director, International Bank B, 2011).

The Central Bank is not acting as lender of last resort to the banking sector and consequently because of liquidity problems, and to avoid liquidity issues, banks structure lending deals backed by specific deposits or lend on core current account balances as illustrated below:

> "What we are doing is two pronged; one we have some core deposit [current account deposits] where we know that at any one time the minimum it has ever been is this. Of that core, we can lend maybe say 60% of that then you use the other 40% to cater for cash, payments and withdrawals and so on. Then over and above that, we then have back to back. A client comes in and wants to invest for 90 days we match them with a client who wants to borrow for 90 days.

So we match the borrower and the investor, and we take a margin." (Executive Director, Domestic Bank A, 2011).

Consequently, interest rates for short-term finance as at September 2011, ranged from 10 to 30% per annum depending on the commercial bank (ibid). High interest rates are driven by an illiquid market characterised by low savings (ibid). One banker remarked that interest rates were high because it was a sellers' market (Senior Manager, International Bank B, 2011). Other banks bundle the cost of finance as one charge, which includes management fees, drawdown fees and interest rate of 2% per month, implying an annual interest rate of 24% (assuming there is no compounding effect).

Explaining some of the determinants of cost of finance, an executive director with a domestic bank remarked as follows:

> "Local financing, if we are doing on our books, will depend on the prevailing market conditions. I will give you a range and you may be shocked. The pricing can range from, the lowest I have on my books is 17% and the highest can even be 26% or so, and these are corporates hey. Some clients who bring a deposit will be looking at an interest rate [deposit interest rate] of 11 % or 12 % [per annum] and then you add the 5% to cover for risk [to make the loan interest rate to the borrower 16 or 17% per annum]" (Executive Director, Domestic Bank A, 2011).

Table 31 shows bank lines for two pharmaceutical companies. Interest rates on overdrafts and short-term loan ranged from 14 to 18% per annum depending on the bank. Establishment fees were 1.25%, payable for every new facility. For letters of credit, establishment fee is 1.25% of the value of the letter of credit and a monthly charge of 0.40%. An interesting phenomenon is multi-banking (see Table 31). Pharmaceutical company A accesses facilities from four different banks, which could indicate capping of lending lines by banks or a strategic decision by the

pharmaceutical company to shop around for better prices. One pharmaceutical executive argued that it was more to do with shopping around for better prices (Managing Director 1, 2011). Bankers on the other hand argued that companies resort to multi-banking, and picking up facilities from many financial institutions because of limitations on the size of borrowing facilities from a single bank (Head of Corporate Banking, Domestic Bank D, 2011).

Table 31: Working capital finance facility from commercial banks for two pharmaceutical companies in Zimbabwe.

Current Commercial Bank Facilities For Pharmaceutical Companies						
	Bank A	**Bank B**	**Bank C**	**Bank D**	**Bank E**	**Curent Outstandings**
Company A	$ 2.2 m	$ 2 m	$ 1 m*	$ 1.5 m*		$ 2.3 m**
Company B					$ 500K	
Company C, D and E	Data not Available.					
Short Term Borrowings Cost of Funds						
Establishment Fee	1.25%					
Interest rate	14 - 18%					
Letters of Credit Cost of Funds						
Establishment fee	1.25%					
Monthly Charge	0.40%					

Notes: * Includes Letter of Credit Facility utilisation for $ 973K to suppliers of APIs. ** Facility Pending Security Perfection. Tenor 90 to 180 Days Renewable

Source: Managing Director Pharmaceutical Company B (2011) and Finance Manager, Pharmaceutical Company A (2011).

CAPS pharmaceuticals accessed short-term loans from five commercial banks at a weighted average of 20-30% per annum, which rose to USD 5.87 million in 2010, causing challenges for the company when it did not operate profitably consequently the loans went bad and were called up

(Table 27). CAPS blamed their woes on exorbitant interest rates charged by commercial banks, which had given them notice to auction their fixed assets (Press reports[22]).

High interest rates are symptomatic of African lending. Nissanke (2001) and Andrianova (2010; 2011a; 2011b) pointed out that lending in Africa is characterised by high interest rates and high interest spreads. Chigumira and Masiyandima (2003) found evidence of high lending rates in Zimbabwe caused by an oligopolistic banking structure and conventional lending that rationed credit to small and medium enterprises. Chigumira and Masiyandima's (2003) findings are confirmed by this study and the situation has become even more acute because of lack of savings. Carmody (1998) also reported incidence of high interest rates in Zimbabwe after financial liberalisation, accompanied by a tight credit policy. The high interest rates affect access to finance, investment strategies and productive capacity expansion in Zimbabwe (Zwizwai *et al.*, 2004, Stoneman, 1990).

In addition to exorbitant interest rates, some banks short-date credit facilities in order to collect management and arrangement fees frequently. Management fees or arrangement fees (also referred to as non-funded income) are supposed to cover the cost of arranging bank loans. Banks truncate the bank loan facility; instead of offering a renewable 1-year facility, they offer 3 month or 6 month facilities and collect management fees at each renewal as reflected in the remark below:

> "It's a way of improving the return [profit]. Instead of recovering [management fees] once a year, you get it twice, and getting it upfront, accelerating revenue collection and revenue" (Executive Director, Domestic Bank A, 2011).

With the reduced volumes of lending, commercial banks drive hard this non-funded income (Executive Director, International Bank A, 2011; Executive Director, International Bank B, 2011; Executive Director, Domestic Bank A, 2011). This institutional behaviour increases cost of funds

[22] http://www.financialgazette.co.zw/comment/12393-the-toxic-debt-overhang.html; accessed 28 April 2012, and http://www.financialgazette.co.zw/companies-a-markets/10129-drugs-giant-on-health-alert.html; accessed 9 October 2012.

for pharmaceutical companies and I discuss this further under the politics of lending (see section 6.5). In the next section, I discuss how banks do lending in Zimbabwe, addressing research question 4.

6.4 How do Zimbabwean Commercial Banks do Lending?

One of the key arguments of this study is that there are complexities and technological capabilities surrounding financing of local pharmaceutical manufacture in Africa that have been ignored. In this section, I seek to unearth the skills and expertise at banks involved in lending, linking them to Lall's (1992) technological framework originally developed for the productive sector and not financial services. Table 32 below represents my approach to addressing research question 3. I discuss how banks do lending focusing on the complexities surrounding loan origination covering prospecting, risk analysis, approval, disbursement and monitoring and control. I discuss the equivalent capabilities used at each stage and link them to Lall's (1992) firm level technological capability framework. I set up the rest of this section as follows: section 6.4.1 explore the prospecting process by Relationship Managers, followed by section 6.4.2 where I discuss the risk analysis done by the risk professionals, the Credit Managers. In section 6.4.3 I discuss the approval process and loan disbursement. I conclude the section by discussing monitoring and control of disbursed loans in section 6.4.4.

Table 32: A summary of how banks do lending and technological capabilities involved.

Bank Lending Function	What They Do In Lending	Fit with Lall (1992) Firm Level Technological Capability Framework
Prospecting: Relationship Managers. These are the sales and marketing professionals and they are supposed to possess credit qualities for preliminary prospect analysis and further risk analysis.	• Scan the economy for potential profitable borrowers. • Networks and connections in various economic sectors. • Boundaries are defined by Credit Policy and Underwriting Standards. • Key attributes: Knowing the economy, knowing industry, and knowing business. • Reliance on codified and tacit knowledge, hence the need for "old timers" for institutional memory and tacit knowledge.	**Investment Capability**: Pre-investment Capability and Project Finance Appraissal; **Linkages within Economy**
Risk Analysis: Credit Managers. These are the risk professionals who work in conjuction with the sales and marketing professionals	• They analyse financial and other pertinent information about the borrower. • Some processes such as financial ratio calculations are routinised and some banks use specific credit analysis software linked to databases to compare business and industry metrics. • Both tacit and codified knowledge are key attributes. • They prepare the internal project proposal document for approval according to internal policies.	**Investment Capability**: Project Execution Capability and Project Finance Appraissal
Loan Approval: Credit Approvers. There are senior risk professionals, and it is not uncommon to have former Credit Managers or Relationship Managers manning this function	• Based on project matrics, credit policies, underwriting standards and appetite for credit business they approve, sent back for ammendments or decline loan applications. • They usually are highly connected (linkages) within banking and economic sectors. • Codified knowledge and tacit knowledge, "gut feel" used in appraissing project proposals.	**Investment Capability:** Project Execution and Project Finance Appraissal; **Process Engineering; Product Engineering and Linkages within Economy:**
Loan Disbursement: Credit Administration	• They are the "gatekeepers" of the credit process. • They ensure all documentary and policy requirements are satisfied before transfer of funds into the borrower's account. • Highly routinised operations with go or no go decisions at each stage, accompanied by sign-off at the right authority level. They are a Relationship Manager's worst nightmare.	**Process Engineering**
Monitoring and Control: Relationship Managers; Credit Managers; Credit Approvers	• Constantly assessing the credit "health" of the borrower using triggers and covenants set in he loan approval document. • Ultimate responsibility lies with the Relationship Manager although Credit Manager and Credit Approvers all assist in monitoring and control. • Highly routinised operations where the staff, frequently check bank reports, press reports and news in the grapevine; leveraging linkages in the economy. • This process is also used to scan for new opportunities to lend or cross-sell other bank products.	**Product Engineering; Process Engineering and Linkages within Economy; even Investment Capability**

Source: Developed by author from experience and interviews with lending and risk executives in banking.

6.4.1 Prospecting process

The Relationship Manager (RM) (see Table 32) initiates the loan origination process, as the primary contact with the customer (Chief Risk Officer, International Bank A, 2011; Executive Director, Domestic Bank A, 2011). The RM is embedded in the credit process; from prospecting, to risk analysis, loan approval, disbursement, and monitoring and control of the account until repayment of the loan (Chief Risk Officer, International Bank A, 2011). The RM is the nucleus of the loan origination process as he/she initiates and manages the process through the various stages

(see Table 32). The RM should possess a high knowledge of the economy, different industries and businesses to know which sectors are performing well (ibid). The RM requires a generalist but in-depth knowledge of the economy, credit skills to make preliminary analysis of the project and at the same time must have linkages both within the bank and within the economy to be able to get information that helps in the prospecting process. RMs rely on codified and tacit knowledge and also depend on old timers for tacit knowledge and institutional memory (see section 6.2.2). The productive firm level technological capabilities exhibited by the RM are project finance and investment capabilities (see Table 33). The RM is bounded by credit policy and underwriting standards as reflected below:

> "These are the ones [credit policy] that give overriding direction, be it strategy, or the underwriting standards themselves; to say how do you process an application. So these [credit] policies range from giving you guidance on the processes and also approval levels" (Chief Risk Officer, International Bank A, 2011).

To reiterate the importance of credit policies in defining the boundaries within which the RMs operates, a Senior Manager described their credit policy as follows:

> "In our [credit] policy we have got companies that we don't want to lend to or industries that we are not happy to lend to, which industry we should approach with a lot of caution and why". (Senior Manager, International Bank C, 2011)

The Chief Risk Officer of an international bank defined underwriting standards as follows:

> "Underwriting standards basically, what we are looking at, it's a strategy, credit strategy for our country. So we say which sectors do we want to go into, and which ones are prohibited totally, and this is where sometimes we would have burnt our fingers. But it depends with the dynamics. I can give you an example, we never used to touch flowers (horticulture) but with the developments that happened, it has become a lucrative industry. People had a learning curve both

for the farmers and the banks. So we are now into horticulture as well" (Chief Risk Officer, International Bank A, 2011).

The quote above reveals the learning process essential for process and product innovation in the financial services industry. The "learning curve process" implies modification of credit policies and underwriting standards when fundamentals change. These are the complexities are ignored by the current discussions and analyses of the financing of local African pharmaceutical manufacture (see chapter 1). These technical competencies cannot be assumed to exist and be efficient in African financial systems.

In the prospecting process, Credit Policy and Underwriting Standards are used in conjunction with customer segmentation matrices (Table 33). Market segmentation can be based on turnover, number of employees, ownership structure, domicile of ownership and type of company, among other traits (Chief Risk Officer, International Bank A, 2011; Executive Director Domestic Bank, B, 2011; Executive Director, International Bank A, 2011). Locally owned pharmaceutical companies used to fall into the small to medium segment, and for a number of banks this sector falls under Retail Banking (Chief Risk Officer, International Bank A). The implications of this classification are that a company is managed on a portfolio basis where it is not uncommon to have as many as 40 or more companies under the management of one portfolio manager, who is not as experienced and senior (ibid). Retail Banking is not a specialist-lending centre, has low lending limits and is not geared for the relationship management model. Resultantly segmentation can work against local manufacturing companies (ibid). The situation in Zimbabwe though, because of the economic downturn has changed and the pharmaceutical sector is now handled in the corporate banking division (ibid).

Table 33: An example of a customer segmentation matrix based on annual sales and number of employees employed by a company.

Type of Enterprise		Number of Employees	Annual Sales (US$)
Micro Enterprise		1 to 10	Less than 200 000
Small Enterprise		Up to 20	200 000 to 4 Million
Medium Enterprise		20 to 99	4 Million to 16 Million
Large Enterprise		More than 100	More than 16 Million
Multinational Corporates	Medium Enterprise	20 to 99	4 Million to 16 Million
	Large Enterprise	More than 100	More than 16 Million

Source: Beck *et al.*, 2009, practice and fieldwork, 2011

The Relationship Manager collects information from key financial executives at the borrowing company (ibid). The banking relationship is multi-tiered; linking executives at the bank and borrowing company and operational staff especially in the borrowing company's finance department. An executive with an international bank pointed out the importance of knowing key contacts:

> "Knowing who the finance director is key, who is the marketing director, who is the CEO, who is the operations manager? Is the company in good hands, especially the top management and those were the people you mostly relied on, their credibility. Otherwise if you didn't know them then it would be difficult to assess the company" (Senior Manager, Domestic Bank D, 2011).

This quote is key in Lall's (1992) technological framework as it reflects the importance of linkages between pharmaceutical companies and banks (see section 3.6). Linkages are critical for the bank as they depend on both codified and tacit knowledge and information to analyse credit applications. It also cements the importance of thinking of project finance capabilities as a new capability that straddles different types or levels of capability.

In the next section I turn to risk analysis.

6.4.2 Risk analysis

RMs request audited financial accounts, management accounts and memorandum of articles of association to check for borrowing powers, mandates and borrowing limits imposed by boards (see Tables 34;35) (Chief Risk Officer, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). Other documents requested include debtors and creditors aged analysis, cashflow projections and budgets. An organisational learning manager with an international bank described the process as follows:

> "We always wanted audited accounts from our clients and for those that were not strong we wanted them 3 months after the year end. Because when some companies are not doing well they can drag the audit process they will try and avoid the audit process as much as possible and delay. So that means we won't know the exact position of the company, so that becomes more important for us to know it sooner rather than later" (Senior Manager, Organisational Learning International Bank, 2011).

The above quote reflects getting historic and interim information to avoid adverse selection and moral hazard (Allen and Santomero, 1997, 2001; Bhattacharya and Thakor, 1993; Scholtens and van Wensveen, 2000, 2003).

Table 34 shows documentary requirements from the borrower and the metrics measured from each class of information, and Table 35 describes qualitative information analysed by Credit Managers in conjunction with Relationship Managers (Executive Director, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). They analyse operations management, asset and liability management, industry risk, business risk , management risk, market risk, country risk, sovereign risk and shareholder analysis amongst other risks (see Fig 22;23). Under business risk

analysis (see Fig 22), they analyse general characteristics of the business; covering company size, maturity and how diversified it is (Executive Director, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). For the operating cycle, the analysis covers supply risk; production risk; demand risk; delivery risk; and collection risk (see Fig 23). The analysis also covers the following; product-market match, production, demand and supply dynamics, sales and distribution and management experience, depth and integrity (Executive Director, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). Relating these operations to theory, it is apparent that all these operations are geared to handle asymmetric information and unearth the risks that the financial intermediary is underwriting (see section 3.5). As argued in section 3.5 some of the operations of financial intermediaries include risk transformation and ameliorating information asymmetries between investors and savers.

Table 34: Financial information collected from potential borrowers and used in the credit process.

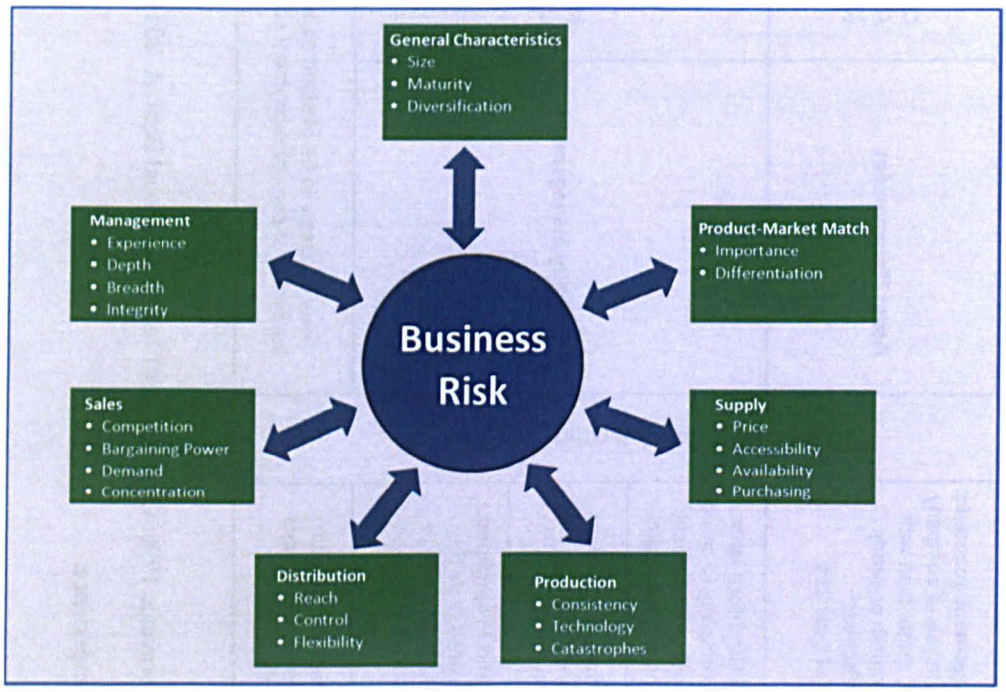
Hard (Quantitative) Information		Metric Under Consideration		
3 Year Audited Financials: Integrity of the financials depend on the reputation of the auditors. If International affiliated then a higher score is given.	Financial Statement Analysis	**Operations Management**	Sales, Cost and Profitability	**Profitability Ratios**: Gross Margin, Operating profit Margin
Latest management accounts: Short term analysis of company performance, rather than wait for interim 6 month or yearly accounts to discover deterioration of business conditions.		**Asset Management**	Quality and Liquidity of Assets, and Asset Mix (Stock and Fixed Assets)	**Efficiency Ratios**: Sales to Assets, Stock Days on Hand, Creditors Days on Hand, Debtors Days on Hand, Sales to Net Fixed Assets, Return on Assets (ROA), Return on Equity (ROE)
Debtors and Creditors lists: Ability of the company to collect money from debtors efficiently and pay their creditors on time.		**Liability Management**	Matching liabilities to asset conversion cycle	**Leverage**: Debt to Assets, Debt to Networth, Debt to Tangible Networth, Interest Coverage Ratio
Budgets: What are the plans for expenditure and where will revenue come from?				**Liquidity**: Current Ratio, Quick Ratio (Acid Test)
Cash flows and Projections: Does the business have the capacity to generate enough cash to pay back the loan on schedule?				
Security Values of pledged assets from reputable valuers, approved by the bank.		Value of assets to be pledged as security, which can act as a secondary form of repayment in the failure of primary repayment sources.		

Source: Omega Performance 1996; Chief Risk Officer, International Bank A, 2011; Executive Director Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D; 2011and researcher's experience.

Table 35: Qualitative information obtained from borrowers for use in risk analysis.

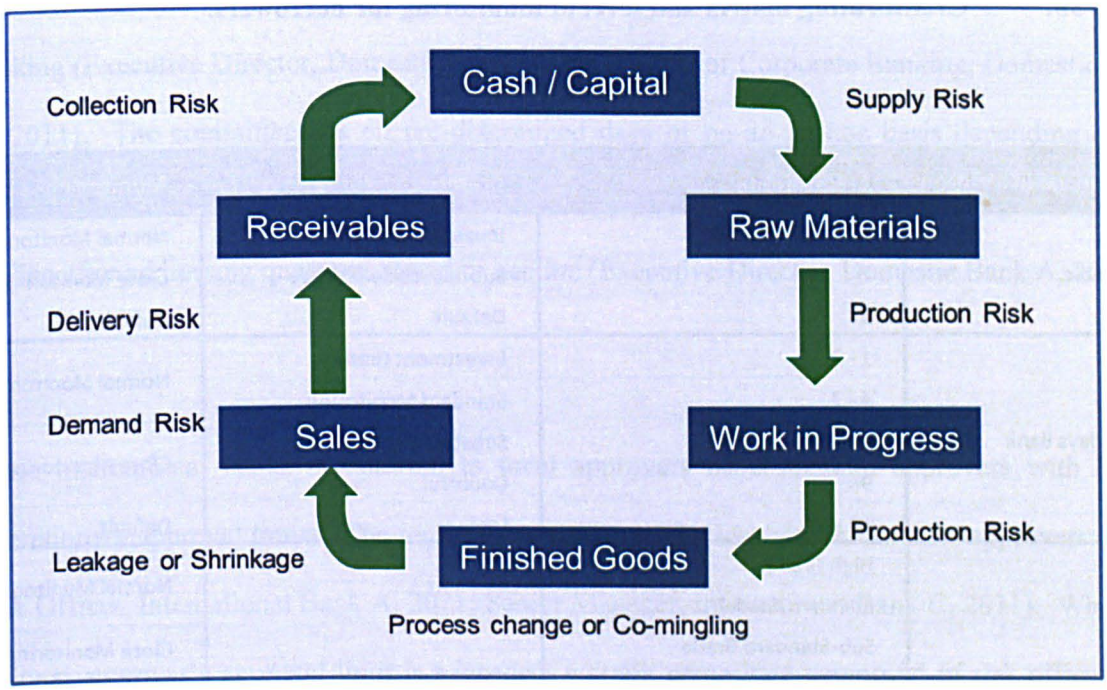
Soft (Qualitative) Information	Metric Under Consideration
Industry Risk Analysis	Trends and dynamics that affect all companies operating in that sector, including threats from substitute products.
Business Risk Analysis	Management's ability and strategies to deal with product-market mix, supply and supplier risk, production, competition, distribution, sales processes and customer concentration risk. Issues of succession planning, and training are also considered.
Shareholders Analysis	Shareholder risk, and their commitment to the project. Is there reasonable autonomity and independence of the board for effective corporate governance. Can the board resist moral hazard risk taking by management?
Key Management Analysis	The key considerations are breadth and depth of experience, qualifications, integrity, vision and strategy.
Country Risk	Risk of macro and micro dynamics that determine the competitiveness of a country for business operation and profitability as well as value of assets.
Currency or Exchange Risk	The risk of change of exchange rates for business that operate cross border or for companies that borrow in foreign currency denominated loans.

Source: Omega Performance 1996; Chief Risk Officer, International Bank A, 2011; Executive Director Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D; 2011and researcher's experience.



Source: Omega Performance 1996; Chief Risk Officer, International Bank A, 2011; Executive Director Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D; 2011and researcher's experience

Figure 22: Business risk analysis elements during the credit process



Source: Omega Performance 1996; Chief Risk Officer, International Bank A, 2011; Executive Director Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D; 2011and researcher's experience

Figure 23: The operating cycle and risks analysed

Each borrower is allocated a credit grade (see Table 36), and the loan is structured checking for alignment between borrowing cause and the type of loan offered (Chief Risk Officer, International Bank A, 2011; Executive Director, Domestic Bank A, 2011; Senior Manager, International Bank C, 2012). The allocation of credit grades is part of the efforts to deal with information asymmetry between the bank and the borrower (Gowland, 1998).

Table 36: Credit rating matrix and level of monitoring for borrowers.

Financial Institution	Credit Rating	Grading	Monitoring
Stanbic	A-C	Investment Grade	Normal Monitoring
	D	Sub-Investment Grade	Close Monitoring
	E	Default	Default
Barclays Bank	1 - 3	Investment Grade	Normal Monitoring
	4 - 7	Standard Monitoring	
	8	Substandard	Close Monitoring
	9	Doubtful	
	10	Loss	Default
CBZ	High Grade		Normal Monitoring
	Standard Grade		
	Sub-Standard Grade		Close Monitoring
	Past Due or Individually Impaired		Default
Standard Chartered	1 - 9	The lower the number, the higher the quality of the credit.	Normal Monitoring
	10		
	11 - 12	Doubtful	Close Monitoring
	13 - 14	Impaired	Default

Source: Audited Financial Statements for commercial banks published in the local press according to Reserve Bank of Zimbabwe regulations (Accessed April to May 2011); Chief Risk Officer, International Bank A, 2011; and researcher's experience.

The process then moves to the approval process that I discuss below.

6.4.3 Loan approval process and disbursement

After risk analysis and loan structuring, the process moves to approval, a stepped process moving to higher committees depending on the size of the loan and the approval limits of approvers (Executive Director, International Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). Senior Credit Managers or in other institutions Chief Risk Officers can approve loans (Chief Risk Officer, International Bank A, 2011). For loans above their discretionary limits, the loan application moves to higher approvers (ibid). For domestic banks, the credit committee is

usually made up of the heads of divisions; retail banking, treasury, risk, finance and corporate banking (Executive Director, Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011). The committee sits on pre-determined days or on an ad hoc basis depending on the urgency. The RM can make an oral presentation, and the result can be approval, amendments needed after addressing questions raised or decline (Executive Director, Domestic Bank A, 2011).

Some international banks in addition to local approvers have regional approvers with higher discretionary approval limits. The regional approvers work closely with the local approvers (Chief Risk Officer, International Bank A, 2011; Senior Manager, International Bank C, 2011). When the regional approver's approval limit is exceeded, a credit committee composed of risk officers and senior approvers in different countries convene a meeting (Chief Risk Officer, International Bank A, 2011; Senior Manager, International Bank C, 2011). What is interesting in international banks is the non-involvement of local business line executive management in credit approval (see Fig 24). The ultimate approval level for domestic banks is the Board Credit Committee (see Fig 24) (Executive Director, Domestic Bank A, May, 2011; Executive Director, Domestic Bank B, 2011; Head of Corporate Banking, Domestic Bank D, 2011).

The approval function is the one that seems to use the most of the firm level technological capabilities (see Table 32) as they have to be conversant with investment capability, productive capabilities and linkage capabilities. This exposes the complexities and technological capabilities at banks surrounding the approval process which needs to be discussed and analysed, as argued in chapter 1.

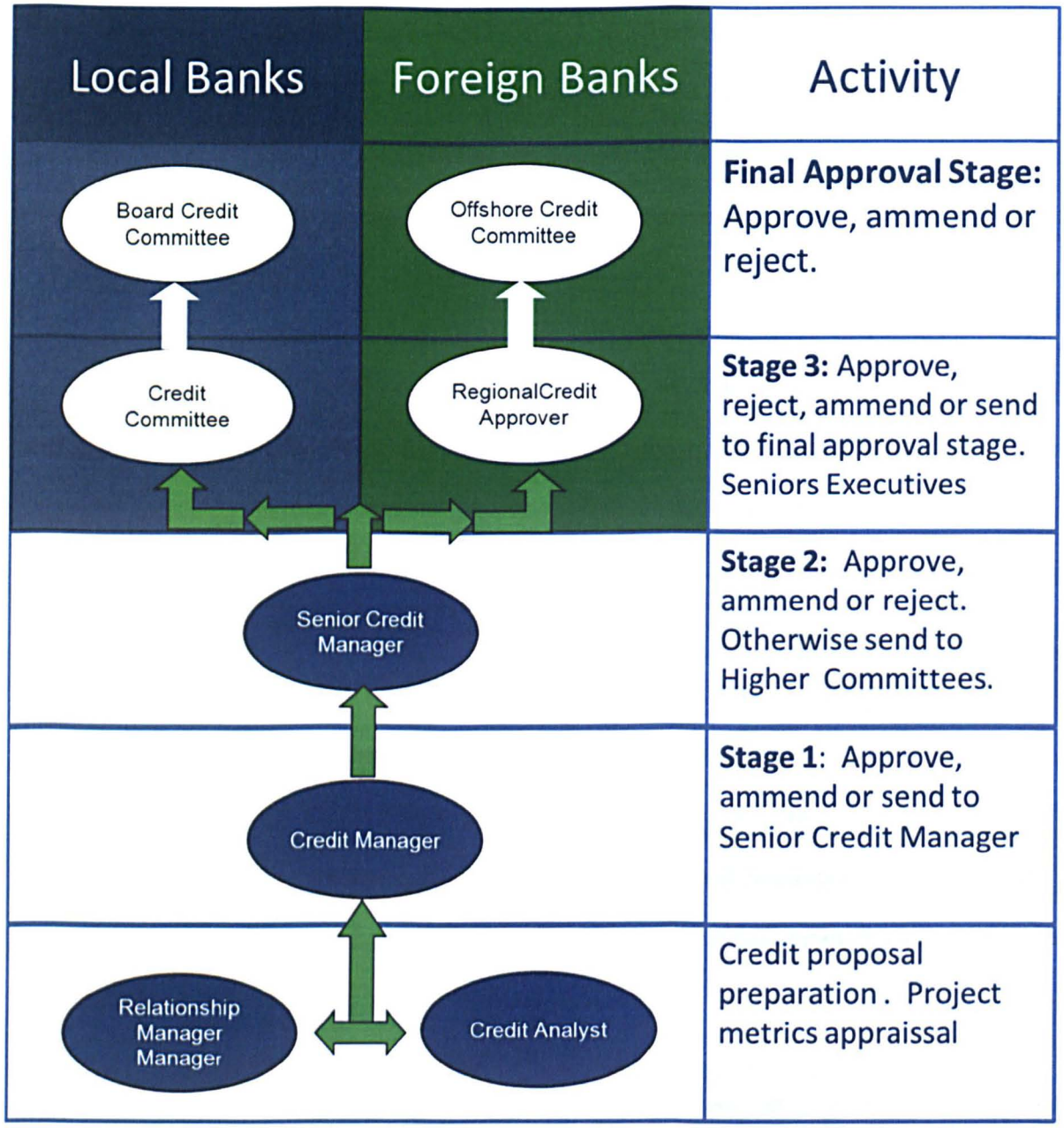


Figure 24: Different approval processes between domestic and international banks.

On approval, the bank generates a contractual document commonly called the facility letter. The borrowing company's authorised officials according to a Board resolution sign on behalf of the company (Chief Risk Officer, International Bank A, 2011). If there are conditions precedents, the loan does not become effective until the bank is satisfied that all conditions precedent have been met (ibid). The credit administration department handles document perfection and transfer of funds into the borrower's account (ibid). Their operations are highly routinised with go or no go

decisions requiring sign-off at each stage by authorised bank officers (ibid). Process engineering is the capability of concern in credit administration.

6.4.4 Loan monitoring and control

RMs monitor the account performance with frequency and intensity of monitoring depending on borrower quality. The better the borrower quality, the less stringent the monitoring requirements (see Table 36). Consequently, MNCs and their subsidiaries with better credit grades tend to have less covenants and triggers compared to smaller domestic companies (Executive Director, Domestic Bank A, May, 2011; Executive Director, Domestic Bank B, 2011; Head of Corporate Banking, Domestic Bank D, 2011). Press reports, networks, economic linkages and interaction with the customer generate information used for monitoring. If there is adverse information, the account can be placed on an early warning system for close monitoring by senior bank management (Executive Director, Domestic Bank A, May, 2011; Executive Director, Domestic Bank B, 2011; Head of Corporate Banking, Domestic Bank D, 2011). Triggers of adverse conditions can include non-payment of interest, violating certain financial ratios or deterioration in financial performance or departure of key executives.

If a loan on the early warning system deteriorates, it is downgraded to a lower credit grade , and depending on the magnitude of downgrade, the account could become sub-standard and the bank provides for the loan and assume that it will not be paid (Chief Risk Officer, International Bank A, 2011). Provisioning levels are scalable upwards depending on probability of non-performance of the loan (Chief Risk Officer, International Bank A, 2011). In some institutions, management of the account is passed on to collection specialists, more experienced with recovery of non-performing loans (Former Sub-Standards Manager, International Bank A, 2011).

In section 6.5, I explore the politics of lending as an additional explanation on why African banks lend so little at high interests and high interest spreads.

6.5 The Politics of Lending

Institutional behavioural factors, credit policies, underwriting standards and revenue generating stream strategies affect how banks make decisions and use credit risk analysis decision-making tools. The first institutional factor is bank ownership. The choice of type of customer to lend to, the economic sector to be involved in and interest spreads can be driven by bank ownership. In this section I set out to address research question 4, to understand the institutional factors that drive bank strategy on revenue streams, lending, who to lend to and at what price

6.5.1 Bank Ownership

International banks prefer to lend to larger, older and more transparent companies which usually are multinational corporates (MNCs), and locally they cherry pick good large local corporates (Senior Manager Domestic Bank D, with 25 years' experience with an International Bank A, 2011; see also De Haas *et al*, 2010). MNCs and large local corporates are allocated senior relationship managers and are more likely to get better representation at credit committee level compared to companies deemed smaller (Organisational Learning Manager, International Bank, 2011). International banks also prefer to lend to subsidiaries of international companies because of their global account management strategies (ibid). Subsidiaries are tentatively allocated a line of credit within the global credit limit for the parent international company (Senior Business Development Manager, International Bank B, 2011; Senior Manager Domestic Bank D, 2011). International banks are forced to align their local strategies to the parent's global strategies. This ultimately drives underwriting standards, credit policy, profit strategies and institutional behaviour (Chief Risk Officer, International Bank A, 2011; Executive Director, International Bank A, 2011; Senior

Manager, Business Development, International Bank B, 2011). This is what I term the politics of lending. Local banks may exercise freedom in setting strategies and credit policies on preferred sectors of the economy to be involved in; however they are limited in their operations by a smaller deposit base (Executive Director, Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank D, 2011).

As mentioned earlier the credit grade determines the premium charged on interest, and as a result, the locally owned companies are likely to pay higher interest charges, management fees, and transactional fees compared to subsidiaries of multinational corporations because of better credit scoring by MNCs and their subsidiaries (Organisational Learning Manager, International Bank, 2011). Considering that the pharmaceutical companies are locally owned, credit policy may be a hurdle to accessing financing from foreign owned institutions (Berger *et al*, 2008). The international banks rationalise their preference for MNCs and subsidiaries because they claim the international parent company can transfer technology, and management expertise. In the event the local subsidiary is financially threatened, the parent can meet the financial obligations to avert reputational risk (Senior Manager, Business Development, International Bank, B, 2011).

That international banks prefer multinationals and their subsidiaries is reflected in the remark by a Senior Manager with an International Bank below:

> "You will find that dealing with multinationals to us is easy as an international organisation. Our life becomes easy because we are connected internationally" (Senior Manager, International Bank A, 2011).

Local pharmaceutical companies can be disadvantaged by an institutional policy that favours MNCs and their subsidiaries and penalised in terms of credit costs for being locally owned. I continue the discussion on the politics of lending by discussing the preference of international banks for transactional banking over traditional lending in section 6.5.2.

6.5.2 Transactional banking versus traditional lending

In this section, I discuss the effect of the dichotomy in ownership of financial institutions and their approach to traditional lending business versus a new strategy emphasising transactional banking revenues; a strategy emanating from international banks because of competition from other institutions that have broken into lending in their home countries.

Commercial banks have two major revenue streams; funded income or risk income from lending activities and non-funded income from fees and commissions (Executive Director, International Bank A, 2011). With risk income, banks earn profits from the interest spread between the deposit rate and lending rate (ibid). In literature, banks earn this revenue or premium for engaging in liquidity, maturity and risk transformation activities (see section 3.5.1). Non-funded income is derived from transactional charges, management fees, arrangement fees, account maintenance fees and commissions (ibid). The bank benefits from its intermediary functions by charging fees and commissions (see section 3.5.1). Revenue stream strategies are critical to understanding the lack of appetite by banks for lending to enterprises compared to non-risk revenue generation activities from carrying out transactional services.

Table 37: Commercial banks full year profit and loss accounts as at December 2010 showing profitability and revenue streams.

	International Banks					Local Commercial Banks									
USD millions	Bancabc	Barclays	Stanbic	Stanchart	MBCA	Agribank	CBZ Bank	FBC	Kingdom	NMB	Premier	POSB	ZB Bank	TN Bank	Metropolitan
Interest Income	16.06	4.47	17.58	6.45	10.22	2.83	47.87	14.76	21.87	10.01	4.56	5.43	16.84	9.13	6.33
Interest Expense	- 7.58	- 1.68	- 0.52	- 0.05	- 2.63	- 1.68	- 21.45	- 4.08	- 7.23	- 3.14	- 5.04	- 1.84	- 5.62	- 3.29	- 3.87
Net Interest Income	8.48	2.80	17.07	6.40	7.59	1.16	26.41	10.68	14.64	6.87	- 0.48	3.59	11.22	5.84	2.46
Forex Income	-	-	5.85	4.52	-	-	-	4.64	3.42	1.06	-	-	-	-	-
Fees and Commissions	10.61	29.34	18.57	31.75	7.46	9.45	45.80	9.65	12.62	9.37	-	-	15.89	1.13	7.88
Other Operating Income	-	-	0.57	0.35	-	-	-	0.72	0.23	-	2.29	11.33	-	1.52	-
Non Funded Income	10.61	29.34	24.99	36.62	7.46	9.45	45.80	15.00	16.27	10.43	2.29	11.33	15.89	2.65	7.88
Total Income	19.09	32.14	42.05	43.02	15.06	10.61	72.22	25.69	30.91	17.30	1.81	14.92	27.11	8.49	10.34
Total Operating Costs	- 14.22	- 33.99	- 31.27	- 30.80	- 12.05	- 18.17	- 41.08	- 20.20	- 24.23	- 15.37	- 9.32	- 11.01	- 24.24	- 6.25	- 7.83
Working Profit	4.86	- 1.85	10.78	12.22	3.00	- 7.57	31.14	5.49	6.68	1.94	- 7.51	3.91	2.87	2.24	2.51
Net Bad Debt Charge	- 0.32	-	- 0.89	- 1.07	- 0.66	- 0.64	- 1.59	- 0.44	- 0.64	- 0.97	- 0.08	- 0.48	- 0.74	- 0.84	- 0.45
Trading Profit	4.54	- 1.85	9.90	11.15	2.34	- 8.20	29.55	5.04	6.04	0.96	- 7.59	3.43	2.13	1.40	2.07
Taxation	- 1.15	0.58	- 2.13	- 2.77	- 0.74	-	- 8.60	- 1.31	- 1.96	- 0.25	2.03	-	- 0.71	- 0.27	- 0.16
Profit After Tax	3.39	- 1.28	7.77	8.38	1.61	- 8.20	20.95	3.73	4.09	0.71	- 5.56	3.43	1.41	1.13	1.91

Source: Bank financial statements published in various Zimbabwean newspapers between April and May 2011 as per Reserve Bank of Zimbabwe regulations.

Table 38: Short-term loan to deposit ratios for commercial banks as at December 2010.

Foreign Owned Banks (International Banks)						
Institution	**Stanchart**	**Bancabc**	**Barclays**	**Stanbic**	**MBCA**	**Premier**
Loan/Deposit Ratio	49%	48%	24%	32%	45%	65%
Locally Owned Banks (Domestic Banks)						
Institution	**CBZ Bank**	**ZB Bank**	**Kingdom**	**FBC**	**NMB**	**Metropolitan**
Loan/Deposit Ratio	74%	63%	97%	56%	91%	65%
Institution	**MBCA**	**Metropolitan**	**Kingdom**	**TN Bank**	**Agribank**	**POSB**
Loan/Deposit Ratio	61%	72%	147%	90%	73%	63%

Source: Financial statements published in local press April to May 2011 as per RBZ regulations.

International banks tend to use transactional banking revenue as the main source of revenue to finance their bank operations (see Table 37). This strategy is reflected in the quote below:

> "At the moment the bank is not driven by lending it is driven by transactional revenue. I think where we are going it's not the interest [risk income from lending], I think if you look at the funding costs and interest margins of 5%, for the size of lending that we do it cannot sustain our operations [because lending is currently very subdued] Transactional banking, NFI (non-funded income) is the income to worry about. Lending consumes the balance sheet, it consumes share capital. So no institution is keen in pushing its balance sheet. RIWAC [Risk weight adjusted capital] issues". (Executive, Director, International Bank A, 2011).

Bank ownership seems to drive the strategy for transactional banking revenue streams preference for foreign owned banks in Zimbabwe. Non-funded income is taking prominence over risk income (net interest income) for international banks (see Table 37) as they prefer transactional banking over traditional banking as shown in Table 38. International banks because of their dominance in the deposit market and higher numbers of endowed customers, prefer to generate revenue through transactional banking rather than lending as reflected in the quote above. The strategy of preferring

transactional banking to traditional lending is prevalent amongst the international banks, as analysis of their financial statements shows (Table 37). Non-funded income covers or just about covers their total operating costs, compared to domestic banks. This is one of the strategic differences in appetite to lending (risk income) in the politics of lending. Domestic banks are adopting the preference for transactional banking revenues as this quote suggests:

> "We do have the same [focus on non-funded income and transactional banking]. If you look at our financial you will also see the same trend in there but for us we cannot run away from direct products like lending. We are a local bank fully committed to local development so we do go into that [lending] but we balance the act. We also go into the direct [lending] products and like I said before we are onshore and in terms of risk assessment we have a better appreciation., and also we have robust credit granting processes, our systems are robust" (Head of Corporate Banking, Domestic Bank B, 2011).

Thus, a hybridisation of strategy because of executive staff movement between banks seems to be trending for revenue generation. However, international banks show a higher capability of non-funded income covering operational costs than domestic banks (see Table 37). In general, local commercial banks do not seem to exhibit this business model of non-funded income covering operational costs to the same extent as international banks, as they are not able to generate the magnitude of transactions that can support this strategic thrust (see Table 37). International banks hold high levels of deposits because of flight to safety by depositors who prefer international banks to domestic banks as they feel their money will be safer (Group Chief Executive, Domestic bank, 2011). An executive who used to work for an international bank and now works for a domestic bank echoed the hybridisation of strategy set by the international banks as follows:

> "Our philosophy is a bit different [to other domestic banks], our model is that transaction based fees [such as service fees and commissions] all that non-funded [income] must pay for all our operational costs and interest income [risk

income from lending] is our cream" (Executive Director[23], Domestic Bank A, 2011).

Hybridisation of ideas and strategy was also evident in lending policies (ibid). As executives and managers move from international banks to domestic banks, they migrate with what they call "best practice" from international banks whether it is lending matrix templates or strategic thrusts (Executive Director, Domestic Bank A, 2011; Head of Corporate Banking, Domestic Bank B, 2011). Making transactional banking revenue the main income has serious implications for lending in an economy that requires lending because local industry is not cash rich and has few sources of external finance.

Another source of non-funded income are management fees (arrangement fees) which are meant to cover the cost of putting together the facility; prospecting, screening, credit risk analysis, loan structuring and documentation as well as monitoring and control (Chief Risk Officer, International Bank A, 2011). Management fees range from 1% to 2.5% of the loan facility (ibid). If a commercial bank arranges a facility for US$ 10 million, when the borrowing company accepts the terms and conditions; 1% of US$ 10 million is charged to their account and the bank collects US$ 100 000 upfront. For the not so good companies, management fees can be as high as 2.5% of facility. In the case of a US$ 10 million loan facility, this equates to US$ 250 000 upfront charges (Executive Director, Domestic Bank D, 2011; Head of Corporate Banking Banks B, 2011; Senior Organisational Manager, International Bank A, 2011). A senior manager illustrated how they charge management fees in the quote below:

> "For some corporates I think 2.5%, you can get away with but on average for top end its 1%, gravitating towards 2% depending on how desperate the client is. Because there are no volumes the fees charged are now higher." (Senior Manager, International Bank B, 2011).

[23] The Executive Director acknowledged that strategies are basically copied from international banks, whether credit risk analysis or running the bank. He said when people move to domestic banks they import policies, systems and standards from the international banks whom they consider to be at the cutting age because of global presence and resources focused on formulating strategy at group level.

With current reduced volumes of lending in Zimbabwe, commercial banks drive hard non-funded income. The guiding philosophy as mentioned earlier is that non-funded revenue must pay for all the bank's operational costs and interest income is the 'cream on the cake' (Executive Director, Domestic Bank A, 2011). The Director said if banks stopped lending, they should break even from transactional banking revenues only (ibid). This partly explains the shift to and dominance of transactional banking over traditional lending products in Zimbabwe and is part of the politics of lending, explaining why lending is low in Zimbabwe. The pharmaceutical companies have recognised this bank strategy as one executive lamented:

> "What we have realised as well is that the banks are capitalising on short term facilities where they can give you a facility for 3 months and then they charge you a facility arrangement fee. It can range from 3 to 10% [total cost to the company per month]. So you can see a situation where every 3 months you are being charged 5%." (Managing Director, Pharmaceutical Company B, 2011)

Domestic banks justified short-dating short-term finance facilities by explaining that unlike international banks, they are constrained by the current liquidity crunch in lending to enterprises and that forces them to shorten the tenor of the loans as reflected in the quote below:

> "We don't have liquidity, whereas we are short term financiers that should give money up to 12 months, it has not been the case, we started something like 30 days, we went to 3 months, then 6 months now for some but its largely 90 days for most" (Head of Corporate Banking, Domestic Bank D, 2011).

This quote reveals that other than a strategic thrust to prefer transactional banking to traditional lending by international banks and the gravitation of other domestic banks towards that, other domestic banks may be charging high transactional fees as a way to survive and generate revenues because of liquidity challenges. This transactional banking versus traditional lending thrust by commercial banks, especially the well-endowed international banks is part of the politics of lending explanation for subdued lending in an African context, high interest rates and high interest spreads; at least this in the case in Zimbabwe.

From a financial intermediation theory perspective, the preference for transactional services over traditional lending reveals that the local financial institutions are choosing to limit themselves to the brokerage services function of financial institutions whilst clearly steering clear of risk, liquidity and maturity transformation activities that are argued to add value to the economy. In a sense, the banks are taking the narrow operational approach to the function of a financial intermediary by not delving into the riskier aspects of financial intermediation (see section 3.5.1).

6.6 Conclusion

In this chapter, I set out to address research questions 1, 2, 3 and 4. It emerged that banks do not play a role in capital investment because of lack of domestic savings and foreign currency to import plant, equipment and machinery. This is a historical situation as industry was set up using FDI and foreign loans. Internal funds made up of retained earnings and profits were used to finance enterprises as capital was locked up in the country from the UDI era in 1965 up to independence and afterwards (Bond, 1993, 2000; Phimister, 2000). Merchant banks and commercial banks were active in lending long term; however, they mediated only domestic savings whereas foreign currency is what is needed to import technology as was argued by Dailami and Walton (1989). This finding is critical for many African countries because they do not fabricate or manufacture capital equipment locally, so the source of technology is only imports and this necessitates foreign currency long term loans. In as much as African countries can save long term deposits, the issue of foreign currency is critical. For a country like Zimbabwe FDI at the moment is a tall order because of macroeconomic instability and the indigenisation drive. Regional financial institutions have exhibited an institutional arrangement innovation to avail long term finance for recapitalisation.

It emerged that banks are active in the short term finance arena, unsurprisingly so because historically this has been their forte. The above findings address research questions 1 and 2 (see sections 6.1; 6.2; 6.3). In addressing research questions 3 and 4, it emerged that there are

technological capabilities and complexities involved in lending (see section 6.4) that contemporary discourses on financing local pharmaceutical manufacture ignore and assume they exist. The technological capabilities of project finance, investment product and process engineering are both codified and tacit. What is interesting is the application of Lall's (1992) technological capability framework to a financial services firm, in this case to the financial services industry. From this basis it can be argued that in as much as there are technological capabilities in the productive firm, there are also technological capabilities in the financial services sector even though they do not produce tangible products. Thus the aspects of investment, productive and linkage capabilities can be traced in the financial services sector.

From knowledge and learning perspective, the financial services sector has suffered from loss of institutions such as merchant banks and human capital as old timers left the industry without training the next round of apprentices in the intricacies of long term financing of industry. The last section addressed research question 4, to surface an additional explanation to why African banks lend so little at high interest rates and high interest spreads. I proposed the politics of lending driven by institutional behaviour on the back of credit policies, underwriting standards and revenue generation strategies. International banks endowed with high deposits lend little as they prefer transactional banking to traditional lending. Their strategy is that non-funded income from transactional banking must cover all bank operational costs, and in the event they stop lending, the bank must still be operational. These strategies are driven by international banks based on the competition they face in their home countries, and migrate this strategy to Africa, which has a very different financial institutional architecture. Domestic banks because of hybridisation of ideas and strategies as executives and managers move from international banks to domestic banks are also adopting this strategy, which clearly makes lending a business that banks can do without because they can generate revenue from transactional banking. With this thrust, African banks thus deviate from literature that claims banks can be catalysts in industrial development. The banks prefer to carry out the narrow function of brokerage services and omit the riskier liquidity and maturity transformation activities (see chapter 8).

Chapter 7: Paddling Furiously in a Bog; the Business and Operating Environment

7.0 Introduction

In chapter 5; the first of the three empirical chapters, I addressed research questions 1, 2 and 3. With research question 1, I sought to understand how capital investment and working capital requirements for ARV research and development, and manufacture are financed. It emerged that pharmaceutical companies financed capital investment from internal resources, and working capital requirements from both internal resources and expensive bank finance. Trade finance from suppliers of APIs and excipients is non-existent, thus starving the industry of a vital short-term in-kind financing source for working capital requirements. With research question 2, I sought to understand the role commercial banks played in financing ARV manufacture in Zimbabwe since literature points to banks as the most prevalent source of external finance for enterprises. Zimbabwean banks played no role in capital investment. However, because of the ZETRAF fund, an institutional arrangement innovation between Afreximbank and the Ministry of Finance, Zimbabwean banks will on-lend ZETRAF long term funds (USD 70 million) for recapitalisation of industry. They will analyse risk, disburse the funds, and monitor and control the project finance deals. Zimbabwean banks however played a role in working capital finance that pharmaceutical companies argued was expensive. With research question 3, I sought to understand firm level technological capabilities required by pharmaceutical companies to access finance. It emerged that the critical firm level technological capabilities of investment, project finance, and linkages within the economy were vital to accessing project finance for technological capability upgrading. Local pharmaceutical companies however lack project finance skills, which explains why they failed to access offshore loans unlike other Zimbabwean enterprises and African pharmaceutical manufacturing companies.

In chapter 6, the second of the three empirical chapters, I addressed research questions 1, 2, 3 and 4. The results for research questions 1 and 2 confirm the results in chapter 5. With research question 3, I sought to understand the complexities and lending technologies surrounding loan origination. The results point to a complex process involving Relationship Managers, Credit Managers, Approvers, Credit Committees, and Credit Administrators in the bank. External relationships involved linkages with the whole economy and regulators. The bank firm level technological capabilities equivalent to the ones in the productive firm at play included investment, product engineering, process engineering, and linkages within the economy. The banking sector is knowledge intensive, using extensively both codified and tacit knowledge as well as institutional memory. With research question 4, I sought to unravel institutional factors that drive bank strategy on revenue streams, lending, who to lend to and at what price. I developed the politics of lending thesis as an additional explanation as to why Zimbabwean banks lend so little at high interest rates and high interest spreads. Banks prefer transactional banking to traditional lending. Banks are also pre-disposed to prefer MNCs and their subsidiaries to local corporates based on moral hazard and adverse selection issues.

In this chapter the last of the three empirical chapters, I address research question 5, detailed below:

- Research question 5: What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?

I focus on how the business and operating environment drive investors' (venture capital, FDI, or financial institutions) perceptions and confidence on Zimbabwe, and influence provision of project finance for technological capability upgrading. Using Lall's (1992) technological capabilities framework, and concentrating on national level technological capabilities, I discuss how failure at this national level forces firm level compensatory investment in alternative infrastructure. This leads to policy and practice gridlocks, making the Zimbabwean business, and operating environment hostile to manufacturing and financing of ARV manufacture. My focus is on factors

that drive financiers' perceptions and appetite for ARV manufacture credit. I therefore consider Lall's (1992) national technological capabilities that emerged in interviews with Zimbabwean bankers, policy makers, and pharmaceutical industry players.

7.1 National Technological Capabilities

There are factors external to pharmaceutical companies that have a profound effect on investor sentiment, confidence, and appetite for risk irrespective of who they are; a bank, FDI, venture capitalist, sovereign fund managers or institutional investors (Chief Risk Officer, International Bank A, 2011; Executive Director, Domestic Bank A, 2011). These external factors drive political risk, country risk, sovereign risk, business risk, industry risk, social environmental and ethical risks, the ease of doing business, and cost competitiveness (Chief Risk Officer, International Bank A, 2011; Executive Director, Domestic Bank A, 2011). Lall (1992) classifies most of these drivers of business and operating environment under national technological capabilities. Under capabilities (see section 3.6), Lall (1992) discussed physical infrastructure, human capital, and macroeconomic incentives (interest rates, foreign exchange rates, credit availability and political stability). He also discussed incentives emanating from internal and external competition and finally incentives from factor markets (ibid). He touched on institutions external to the firm but which directly affected the capabilities of industry and these could be driven by markets or non-market set-ups and covered legal frameworks, property rights, industrial institutions, training institutions, and technology institutions. I use this framework for the rest of this chapter to discuss the business and operating environment in Zimbabwe that causes pharmaceutical companies and banks to 'paddle furiously in a bog'[24] in their efforts for financing technological capability upgrading.

[24] I use this term to refer to the myriads of hurdles that companies face in their effort to upgrade their technological capability. The hurdles that make company and industrial growth emanate from micro and macro failures as discussed in chapters 5, 6 and 7.

I set up the rest of the chapter as follows; in section 7.2, I discuss national level technological capabilities focusing on physical infrastructure, efficient financial systems, and human capital. In section 7.3, I analyse incentives focusing more on macroeconomic incentives and policy inconsistencies that have characterised the Zimbabwean economy for decades. I also discuss incentives or rather disincentives emanating from international competition in the market for ARVs. I conclude the chapter with section 7.4.

7.2 Capabilities

In section 3.6, I discussed national technological capabilities (Lall, 1992); in this section, I focus specifically on the national technological capabilities of physical infrastructure, and human capital. I also discuss efficient financial systems which Lall (1992) did not discuss in detail. These factors contribute to ease and cost of doing business as well as creating the space for innovation to thrive. I discuss physical infrastructure in section 7.2.1, efficient financial systems in section 7.2.2 and finally human capital in section 7.2.3.

7.2.1 Physical Infrastructure

Electricity supply in Zimbabwe is intermittent and pharmaceutical companies have resorted to purchasing standby generators (see Fig 25) to ensure consistent electricity supply for operations (Production Manager, 2011). Investment in alternative infrastructure diverts funds from operations whilst increasing production costs (ibid). Thus failure at national technological capability level in a key infrastructural input of electricity forced firm level compensatory investment in alternative infrastructure. Provision of alternative infrastructure by private companies instead of dependence on public infrastructure is termed complementary capital and diverts scarce funds from critical productive capital (Reinikka and Svenson, 1999).

One Zimbabwean pharmaceutical company purchased a 500KvA generator to ensure continuance of operations for the heating vacuum and air conditioning system (HVAC system) critical to maintaining the World Health Organisation (WHO) pre-qualification certification. The generator consumes 110L of diesel per hour; which at USD1.45 per litre (September 2011) equates to an hourly cost of US$ 160. This increases production costs and reduces profitability (see section 5.2.1). Power outages can last between 3 to 5 hours and if there is a significant grid fault then it can be 12 to 24 hours (Production Manager, 2011). Power loss in the middle of a production run is costly if there is no back-up generator as all the work in progress has to be discarded (Managing Director 1, 2011; Production Manager, 2011). Intermittent supply of electricity imposes a difficult operating environmental challenge, forcing dependence on expensive backup generators (Maintenance Manager, 2011).

Figure 25: A 500KvA standby generator to compensate for intermittent electricity supply

Estimated running costs for different power outage time periods are shown in Table 39. Intermittent supply of electricity is disruptive to continuous pharmaceutical manufacturing operations and imposes additional energy costs ranging from USD 30 000 to USD 250 000 per annum. Currently there are plans to increase power generation but in the short term, the country requires supplementary regional imports from Mozambique and South Africa, which can be cut off if debt is not serviced timeously (Managing Director 1, 2011). The plans include a joint power scheme with Zambia on the Batoka gorge and private power generation schemes in Gokwe (thermal power station) and Chiredzi (ibid). Financiers consider stability and consistence of industrial inputs in their business and industry risk analysis (see section 6.4.2).

Table 39: Estimated running fuel cost for a 500KvA generator.

Hourly Consumption: (Litres)	Power Outage: Hours per Day	Cost of Alternative Power Infrastructure (USD)			
		Daily Cost	Weekly Cost (6 days)	Monthly Cost	Annual Cost
110	8	880	5,280	21,120	253,440
110	7	770	4,620	18,480	221,760
110	6	660	3,960	15,840	190,080
110	5	550	3,300	13,200	158,400
110	4	440	2,640	10,560	126,720
110	3	330	1,980	7,920	95,040
110	2	220	1,320	5,280	63,360
110	1	110	660	2,640	31,680

Source: Production Manager and Maintenance Engineer, Pharmaceutical Company A, 2011 and calculations by the researcher (based on diesel costs in Zimbabwe in September 2011). Assuming a 6 day production week.

Turning to water, strict adherence to water quality standards and water pressure thresholds in drug manufacture is essential (Production Manager, 2011). However, water supplies are frequently interrupted by pipe bursts and pump station breakdowns because of aged water supply infrastructure (ibid). Pharmaceutical companies were forced to invest in boreholes; another alternative infrastructure investment, diverting financial resources from operations to infrastructural

provision (ibid). As a result of poor quality of water, companies have to frequently change imported filters for water treatment. These filters are subject to duty and VAT and therefore increase operational costs (ibid). The additional cost in assuring water quality is reflected in the remark below:

> "The water has to go through the RO [reverse osmosis water treatment] plant. I actually have some invoices on the filters and they have to be changed every 2 or 3 days. That's how bad our water is. That's not healthy especially if you are getting them from South Africa and you still have to pay duty for them, and the clearing agents and the transportation costs" (Procurement Manager, 2011).

Failure to provide basic infrastructural support to the pharmaceutical industry forced a compensatory firm level investment in alternative (complementary) infrastructure (Reinikka and Svenson, 1999) because of an ageing water supply infrastructure. Instead of concentrating on the business of innovating and producing ARVs, the companies are forced to provide alternative infrastructure. This operating environmental challenge does not paint the local pharmaceutical industry in good light with any financier (Senior Manager, International Bank B, 2011; Senior Manager, Business Development, International Bank, C, 2011). Consequently in the matrix of key attributes considered in risk analysis, provision of electricity and water (infrastructure) score lowly.

In the next section I turn to financial systems.

7.2.2 Efficient financial systems

Lall (1992) in passing discussed the necessity for efficient financials systems and ability to garner financial resources and physical investment as a requirement for technological capability building. This assumption does not hold for Zimbabwe, as the financial system is anything but efficient. Financing the pharmaceutical industry in Zimbabwe has been an uphill task especially in the last

decade (see chapter 6). Companies were forced to used internally generated funds saved over long periods as illustrated in the remark below:

> "To get to that stage [WHO pre-qualification] we would need a lot of upgrades, which we have since started and the only thing that has stopped us from going the full works is because we have not been able to get the total finance, so we are doing it in stages [using internally generated funds]. We have done the first stage, we have done the second stage and we think we should be going to the third stage. It's a gradual process as and when the finances [internally generated] become available" (Marketing Director, 2011)

Internally financed capital projects are a slow process, as the companies progress as and when they save enough to move their projects to the next stage, with serious consequences for technological capability upgrading. Dailami and Walton (1989) had praised the Zimbabwean financial system as one of the most sophisticated in Africa, with different financial institutions such as commercial banks, development financial institutions, merchant banks, finance houses, and discount houses. These financial institutions were important for raising domestic resources for industry. However, with economic structural adjustment programmes came the demise of merchant banks, finance houses and discount houses. The IMF as illustrated in the remark below is blamed for causing the decline of merchant banks:

> "Specialist institutions with limited activities within themselves [merchant banks, finance houses, and discount houses] from an IMF perspective, that era is gone. It is the IMF influence that destroyed that segmentation of the market, but in my mind, it makes markets more fluid. It allowed commercial banks to settle with discount houses, discount houses in turn to settle with central bank. What you did is create paper and allow tradability to take place." (Group CEO, Domestic Bank F, 2011).

The Group CEO further explained the dismantling of the old financial architecture precipitated and accelerated by the IMF led structural adjustment programme in the early 1990s as follows:

"The IMF thinking was that why maintain that British-type of architecture, its old fashioned, it's out of sync. So it's a different architecture, but why destroy something good that's working?" (Group CEO, Domestic Bank F, 2011).

Consequently, there was a shift and commercial banks became even more dominant, reducing the number of different financial institutions pointed out by Dailami and Walton (1989) as constituting a deep and sophisticated financial system. Consequently, the merchant banks' influence in long-term lending and their lending technologies dwindled. The lack of an efficient financial system lessens even the structuring of offshore deals as commercial banks preferred to finance trade and commerce; the short-term finance market (see chapter 6). These occurrences and the low key impact of capital markets (see section 2.6) point to lack of an efficient system and makes garnering resources for physical investment an uphill task, creating a 'bog' that pharmaceutical companies have to 'paddle' in. Pharmaceutical companies cannot access long term finance, firstly because of lack of local savings (see chapter 6), secondly lack of foreign currency and thirdly because the financial institutional architecture is not conducive to lending long term for acquisition of plant, equipment and machinery. The neglect in contemporary discourse of these factors reinforces my argument that financing of technological capability upgrading and innovation is important when considering African local pharmaceutical manufacture.

I now turn to the issue of human capital.

7.2.3 Human capital

Both financial institutions and pharmaceutical players face skills and knowledge challenges. They attributed this to the decade long economic meltdown, which caused mass emigration of skilled work force to South Africa, Europe and North America (Director, Research and Development, 2011; Executive Director, International Bank A, 2011; Managing Director 1, 2011). For pharmaceutical companies the affected skills base includes; pharmacists, analytical chemists, and microbiologists (Marketing Director, 2011; Production Manager, 2011). Exodus of qualified

research and development personnel resulted in one company's R&D department shrinking by 50% and another company shutting down R&D activities altogether (Director, Research and Development, 2011; Marketing Director, 2011). Experienced pharmacists and chemists have settled elsewhere, and attracting them back is proving a huge challenge. Some pharmaceutical manufacturing professionals in the diaspora have however expressed an interest in returning if there are openings at local companies (Managing Director 1, 2011; Marketing Director, 2011).

On the back of skills emigration, technological effort becomes a tough challenge due to scarcity of qualified and experienced technocrats critical for process engineering, product engineering and industrial engineering functions. The Research and Development Director surfaced some of these issues in the remark below:

> "So you find if you go into a pharmaceutical company in India they have PhD and Masters Degrees, and they are working in the lab. So they are knowledgeable people, they have been trained and they are capable. So if they decide to work on things they get results. But for us here we are compromised, our education system being good, but having been affected by our conditions we don't have as many and as capable and as innovative and motivated people as we used to have in the past. There are some people who just want to do R&D, but I don't think we still have those kind of people around". (Director Research and Development, 2011).

Lack of qualified and experienced pharmaceutical technocrats hampers technological effort with serious implications for product and process innovation as evidenced by stagnation on old first line ARVs (see chapter 5). When it comes to financing, the situation is compounded by the lack of knowledge of the pharmaceutical industry by bankers. This is illustrated in the remark below where a respondent from the pharmaceutical industry argued that the bankers lacked knowledge not only of the pharmaceutical industry but all industry in Zimbabwe:

> "I have never respected financial industry in Zimbabwe, because they don't understand. If you were going to be a banker or financier of any industry, you need to understand it. You need to understand the basics of the pharmaceuticals, but they don't. Not only the pharmaceuticals but all the industries, you must understand that you must have the a b c's of the industry. If you are going to raise funds [long-term project finance] you will need to understand the business. For example if you talk to everybody right now thy will say you will never go wrong [with pharmaceuticals]. But no! If you look at the basic fundamentals they are lacking. From the economic fundamentals to the company, they are not there to support the pharma business so how does it flourish?" (Consultant, Pharmaceutical Industry, 2011)

This damning remark, in essence summarises the challenges in knowledge and learning; the know-how, know-what and know-who of financing the pharmaceutical industry. In addressing research question 5, these are the key business and operating environmental factors that influence the financing of local ARV manufacture in Zimbabwe. This raises a pertinent question which is, if the financiers do not know the pharmaceutical industry, how can they proficiently analyse risks involved in financing ARV manufacture or local production of drugs for that matter? The quote above reinforces the discussion in section 6.4 and table 31 on the lending technologies and expertise required by bankers in loan origination. These challenges constitute some of the complexities surrounding financing local pharmaceutical manufacture that have been ignored in contemporary debates.

The pharmaceutical consultant was the first respondent I interacted with in my fieldwork in Zimbabwe, and as a former banker with a technical background in manufacturing, his remark caught me off guard. Subsequently, I incorporated his response into my questionnaire and asked the bankers directly thereafter if they understood the pharmaceutical business, especially the business of ARV manufacturing in Zimbabwe. All the responses from the bankers confirmed the pharmaceutical consultant's allegations, and a typical response from the bankers was they did not

know or understand the pharmaceutical industry especially ARV manufacturing as illustrated below:

> "Like if you ask me right now who is manufacturing ARVs in Zim [Zimbabwe] at the moment that information is not readily available." (Executive Director, Corporate Banking, April 2011).

Some bankers were not even aware that ARV manufacture in Zimbabwe commenced in 2003. As mentioned earlier, all the bankers interviewed acknowledged they did not understand the science behind pharmaceutical manufacturing and they did not have personnel with an engineering, scientific, or technical background in their institutions in lending hence the limitation. This is in contrast to a short-lived Mid-Career[25] programme run by Standard Chartered Bank that saw entry of non-traditional banking recruits from engineering, science and other technical fields into banking to solve this problem. Barclays Bank Zimbabwe and Standard Chartered Bank also ran graduate entry programmes where they recruited skills from science, technology and engineering backgrounds. The programmes' purpose was to enhance understanding, analysis and management of risk. However, it seems the programmes' benefits have not trickled through to an understanding of manufacturing in Zimbabwe.

This finding poses two questions: first, as pharmaceutical companies have clearly demonstrated the replication model of innovation by locally producing ARVs in Zimbabwe, what efforts have they made to make bankers appreciate their capabilities and hence attractiveness as credit candidates? This is one of Lall's (1992) firm level technological capabilities of linkages within the economy, where management establishes linkages that are beneficial for improving technological effort. The second question directed at the bankers is; if they acknowledge that they do not understand (do not

[25] The mid-career programme run by Standard Chartered Africa for about 3 years, saw the recruitment of people from diverse technical backgrounds such as engineering, science, mining and other non-traditional banking backgrounds. The logic was they needed to infuse the skills in the bank with non-traditional banking skills that would add value to credit risk analysis, credit risk management and improve credit metrics relying on their technical background. The researcher joined the bank on this programme coming from a science, technical and quality assurance background in the food manufacturing business as well as airline catering industry. As a result of my biotechnology, microbiology and quality assurance knowledge I ended up training graduate entrees on risk analysis and management.

know) the pharmaceutical industry, how much do they know of the structure of the manufacturing sector and what drives the economy? In their defence, the bankers argued that their doors were always open and the pharmaceutical sector had not approached them and tried to explain their operations (Executive Director, International Bank C, 2011; Executive Director, International Bank A, 2011; Executive Director, Domestic Bank A, 2011). This response surfaces an attitude of non-aggressive lending by bankers who expect borrowing companies to pursue them, which points to lack of competition for the lending business (credit rationing) or an entrenched culture amongst bankers that companies must come to them and argue their case out. Either way the prognosis for financing technological capability upgrading and innovation in this culture and environment is dim.

What is apparent is that executives in banks and pharmaceutical companies, have failed in establishing linkages that alleviate information asymmetry and promote knowledge transfer and sharing as discussed by Wade (2009) in his analysis of Taiwan's 1980s industrial development bureau (IDB) approach. Wade described how the IDB was composed of seasoned professionals in industrial engineering, corporate accounting and marketing whose mandate was to keep a close watch on productive capacities. In addition there was a dedicated group that was responsible for coordinating banks to ensure availability of financial resources and tax authorities to synchronise tax and customs incentives and barriers to protect local industry against imports (ibid).

The findings in Zimbabwe clearly exhibit a lack of coordination between banks (financial resources) and the pharmaceutical industry. Strategic management failure was fingered as the main cause of lack of linkages in the economy and with foreign suppliers which slowed technology transfer and human capital up-skilling as reflected in the remark below:

> "And the issue of strategic management is lacking. And people lack an appreciation of what you mean when we say technology transfer. There are various ways and one of them like I was saying is patenting which is easy and free. But we are not making use of that. Then we were talking of some of those

other relationships where you have a parent company seconding people to come and work in Zimbabwe or the local guys can go and work outside the country on secondment. These guys have big suppliers like Aurobindo and they can send their staff on secondment, so that they can learn what's happening in the industry but this isn't happening". (Consultant, Pharmaceutical Industry, 2011)

In the absence of national training institutions (Lall, 1992), firms can engage in training activities. However, currently this is not happening in Zimbabwe, as the local companies are not taking advantage of linkages with their foreign suppliers to pick low hanging fruit in their technological effort. The challenges with skills are not only peculiar to the pharmaceutical companies; even the banks have their fair share of problems (see section 6.2.2). In terms of other local linkages, there is lack of coordination between universities, research organisations, and industry as illustrated in the quote below:

"If you look at SIRDC [Scientific and Industrial Research and Development Centre], there are no linkages between what they are doing and policies and what private sector is doing. Private sector does not even utilise SIRDC. So what's the purpose of having them, in South Africa they call them Science Research Councils. And even collaboration with the universities is not taking place" (Consultant, Pharmaceutical Consultant, 2011).

The issue of human capital is therefore an inherent structural defect as it permeates all sectors of the economy. This was also brought out in the calibre of accounting and finance graduates from the local tertiary institutions. I sat in on a consultative meeting between universities, accounting professional bodies, industry finance experts and the local accounting and auditing board, where there was consensus that the quality of the local accounting and finance graduate was not fit for purpose for the requirements of industry. Many of them after qualifying in Zimbabwe have to sit for South African qualifying exams to be competent as accountants and finance managers (PAAB meeting, 2011). The remark below exposes the calibre of accounting and financial skills:

> "I will tell you I have seen financials and I laugh, and say are these audited financials, and these are the financials that your bank looks at? They don't know how to do financial analysis. Just basic things such as your comprehensive income, financial position and cashflow, you see things are not tallying. Such small things show you there is a problem". (Consultant Pharmaceutical Industry, 2011)

This quote by a person who was not privy to the World Bank sponsored initiative to improve accounting and finance skills mentioned above reveals how rampant the financial and accounting skills challenge is. This gives some insight into why the pharmaceutical companies may have difficulties in investment and project finance capability (see section 5.5). The issue of skills, knowledge and learning reinforces the discussion in section 6.2.2. The country evidently lost "old-timers" endowed with the know-how, know-what, know-whom and know-why (Ernst and Lundvall, 1997) essential for learning and innovation to occur. These skills affected both the financial institutions and the pharmaceutical finance departments.

In the next section I turn to the policy terrain related to incentives

7.3 Incentives

Lall (1992) argued that incentives constituting institutional functioning and government policies influence the development of productive capacities. He characterised the incentives as macroeconomic incentives, incentives from competition, and incentives from factor markets. In this section driven by data from the field, I focus on competition incentives and government policy as incentives or disincentives that affect the business and operating environment for ARV manufacturing and financing in Zimbabwe.

7.3.1 Competition incentives from local markets for ARV drugs

Generic ARVs are highly commoditised products, and access to big markets and economies of scale are key competitive advantages (UNIDO, 2010b, 2011b). Local pharmaceutical companies need to increase their productive capacity and sell to a captive market, and this is where the challenge for the Zimbabwean ARV manufacturer starts, as illustrated in the remark below:

> "You will find that one of the biggest problems we have right now is capacity. Because having produced for Zimbabwe, the volumes are just too low, but if you are going to produce for WHO pre-qualification projects and PEPFAR you will have huge volumes. Right now we don't have the capacity to handle that, [that is] the equipment, because we are producing at a small scale. Our productive capacity is limited because we did not have the capacity to finance manufacturing capability, so obviously our productive capacity is limited to the size of our plants. So when it comes to those serious tenders you need capacity because they need high volumes and so people need to increase their capacity". (Consultant, Pharmaceutical Industry, 2011).

The quote above brings to the surface the challenge of capacity that the local pharmaceutical industry faces in trying to fulfil local and international tenders. Local competition does not exist for them but they face stiff competition on local tenders from Indian pharmaceutical companies, some of whom have set up agencies in Zimbabwe (Marketing Manager, 2011). The local market is small, and as mentioned earlier, government support for public health ARV drug procurement is low (see Fig 27; Table 38).

To compound the issue of capacity, local manufacture of ARVs had stopped for some time during the hyperinflationary era as reflected in the following remark:

> "Looking at just ARVs specifically, we haven't been doing much on production until mid-last year [2010] when we started supplying the National Aids Council (NAC). I think it was because of the economic situation, but

when we started to supply, when we got tenders for ARVs that's when we started manufacturing ARVs on a higher capacity. We had been manufacturing but at a very small capacity". (Procurement Manager, 2011).

This quote brings out the importance of local public health procurement as an incentive to manufacture especially when public health resources are limited. It also explains why the company did not make much progress to the second line treatment ARVs. When they started manufacturing, they had to fight with international suppliers who had established linkages with donor funded procurement agencies, and government support was essential for the local company. As mentioned earlier government promised to procure 75% of all ARVs manufactured locally, however during the economic downturn, this promise could not be fulfilled. Table 40 below shows the proportional support of patients on antiretroviral treatment in Zimbabwe by different funders. The government currently only supports 24% of all ART patients and thus public health procurement use as an industrial policy tool can only be effected with these resources and only on first line treatment ARVs as other regimens are not locally being produced.

Table 40: Proportion of patients on antiretroviral treatment (ART) funded by different players in Zimbabwe

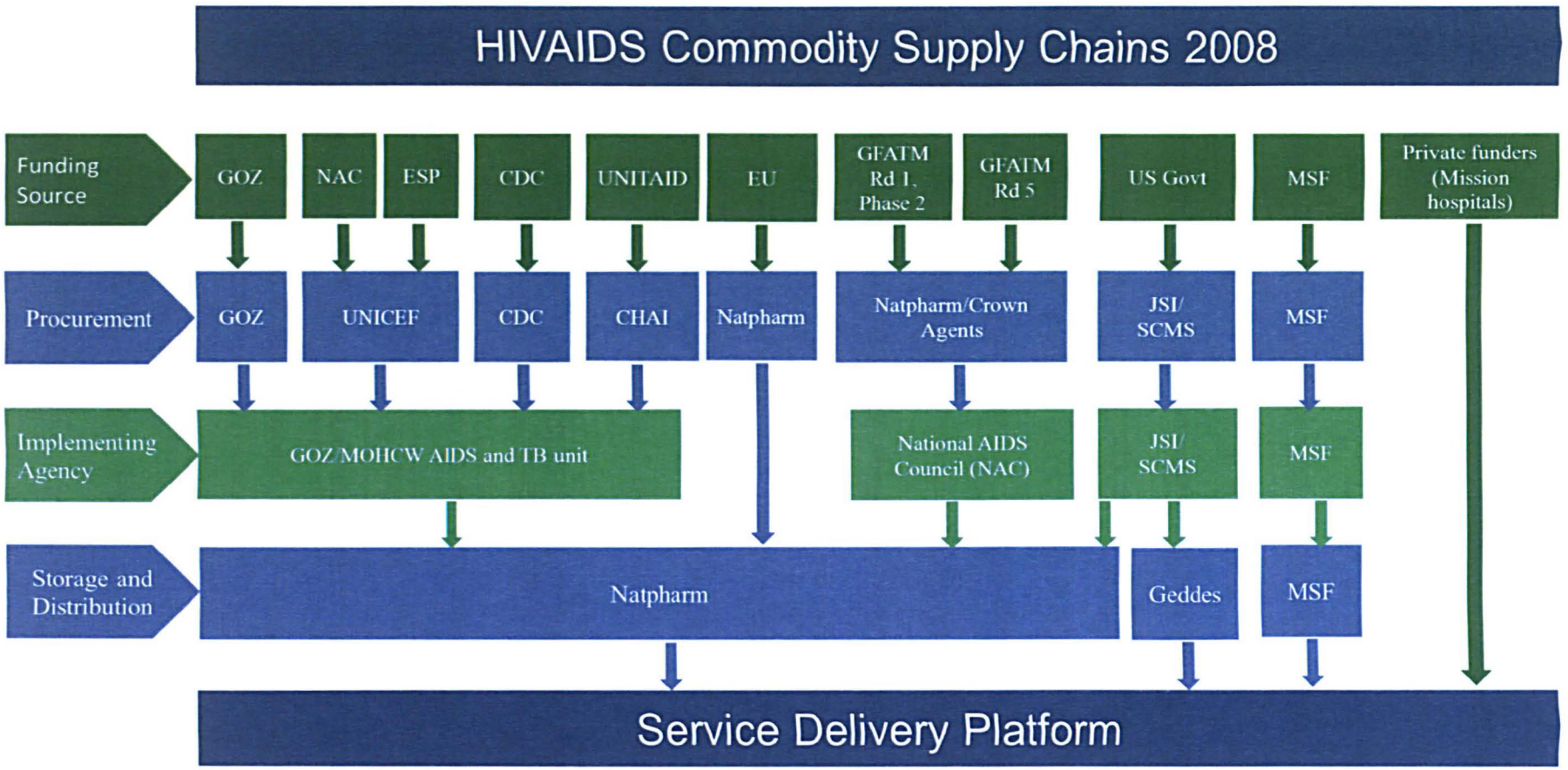
Institution	Support For Patients on ART
Global Fund To Fight TB AIDS and Malaria	35%
US Government	18%
Extended Support Programme Led By DFID	22%
National Aids Council (AIDS Levy)	24%

Source: National Aids Council 2010 Financial Statements

The HIV/AIDS commodity supply chain diagram (Fig 26) reveals the multiplicity of actors involved in the supply of ARVs and other HIV/AIDS related commodities to the Zimbabwean market. Public funding for Malaria, TB and HIV/AIDS is limited as reflected by a budgetary allocation of only USD 2

million (2010/11) for ARV procurement when the country has an estimated 640 000 people who need antiretroviral treatment, which even at the lowest cost of USD 10 per month translates to a monthly requirement of USD 6.4 million.

Donor driven programmes mainly procure their medicines outside Zimbabwe. In Zimbabwe the principal purchaser of antiretroviral drugs for Global Fund is UNDP, which purchases drugs through their pooled procurement base in Amsterdam. This effectively removes public purchase of medicines as an industrial policy tool. In such an environment, the market is unreachable for local pharmaceutical manufacturers unless there is purposive support for local manufacturing industry as was done under the Extended Support Programme that saw local manufacturers like CAPS and Varichem participating in the supply of medicines to the local health system (Table 41). This unprecedented move by the Extended Support Programme which was an EU and DFID funded project contracted local companies to manufacture drugs for the public health system. This move shows that donor driven programmes can be used to support local industry and work as an industrial policy tool. Table 41 shows that two local companies; CAPS and Varichem were contracted to supply over USD 4 million worth of drugs to the programme. The contract value shows the values of drugs that were supposed to be delivered and value delivered shows what the companies actually delivered by the time the report was compiled. This raises a question of why African governments cannot compel the donor community to purchase locally manufactured pharmaceutical products? As Mackintosh (Personal Communication, 2012) argues no one is forcing the governments not to do that. The South African government insists on local supplies and where foreign companies win tenders they have to go into an agency arrangement with a local South African pharmaceutical company, as was the case when a local company won a tender to supply ARVs to the South African public health system (Marketing Manager, 2011). The South African government does not insist on WHO-prequalification; however one can always argue that South Africa has a stronger bargaining power with donors because it has significant local resources (ibid).



Source: Overview of the National OI/ART Programme, Ministry of Health and Child Welfare, May, 2010.

Figure 26: HIV/AIDS commodity supply chains (2008) showing the prominent involvement of the donor community in the supply chain.

Table 41: Donor support to local industry through contracting for local health supplies.

Contracts for drug supply by some pharmaceutical manufacturing importing companies			
Supplier	Contract Value: **Euro**	Value Delivered: **Euro**	% Completion of Supply
Varichem Lot 2	1,788,800	1,522,404	85.11
Varichem Lot 4	198,500	198,500	100
CAPS Lot 1	2,289,784	961,139	41.98
PCD Lot 2	433,967	433,967	100
PCD Lot 3	570,235	570,235	100
PCD Lot 4	198,500	198,500	100
GHC	1,585,464	1,585,379	99.99
Mission Pharma Lot 1	986,615	981,044	99.44
Mission Pharma Lot 5	63,000	63,000	100
SJV	253,280	253,280	100
Total	**8,368,145**	**6,767,488**	**80.87**

Source: EU, 2010.

7.3.2 International competition

In terms of international competition, Zimbabwean exports of ARVs into South Africa face non-tariff barriers instituted by the South African government under the guise of fighting counterfeit drugs (Marketing Manager, 2011). Exports of pharmaceutical products into South Africa must be airfreighted through Oliver Tambo International Airport in Johannesburg, as legislated by the South African government (ibid). This forces all exporters of pharmaceuticals to use expensive airfreight; a non-tariff barrier South Africa has imposed on regional competitors (ibid). South Africa argues as mentioned earlier for a single entry point for medical drugs to fight counterfeits however, the consequence of the strategy loads additional transport costs making imports less competitive compared to South African manufactures (ibid). A development economist commented on the issue of non-tariff barriers and argued that Zimbabwe could reciprocate and bar unwanted products using quality standards as the criteria for protecting local industry:

"There is the issue of WTO that you raised, the issues of technical barriers to trade; there is nothing that can preclude Zimbabwe from utilising the issues of standards to block unwanted goods coming in, because we don't want to be a dumping ground." (Development Economist, Government Think Tank, May 2011)

Whether these strategies will be implemented to support growth of local ARV manufacture remains to be seen. However, the fact that local companies face stiff international competition is reflected in the perception held by local bankers. An Executive Director with an international bank that had tried to finance local pharmaceutical manufacture in conjunction with a Germany Bank brought out the challenge of capability and international competitiveness for the local pharmaceutical manufacturing industry in the following remark:

"We had one Germany bank at one point coming to us and wanting to finance the manufacturing sector. The pharmaceuticals would also have been a portion of manufacturing, and their major problem was the ability of the local manufacturers here to stand against global competitors. Do they have the ability and capability to do so? But their assessment last year [2010] was that we are not ready yet to stand to international competition and they gave us time and said later we will see what we can do." (Executive Director, International Bank C, 2011).

Efforts to export into the region leveraging the WHO-prequalification status were frustrating for almost a year (Procurement Manager, 2011). The manager lamented the cost implications of having an expensive (WHO-prequalified) plant to run that depended on local sales yet was designed for international sales as reflected in the quote below:

"Unfortunately the challenge that we have is that we have got this pre-qualified plant which is expensive to maintain, and the maintenance of the plant is being met by local sales." (Marketing Manager, 2011).

The company reported that international tenders are cut throat business based on prices and as a result, they had gone for a year after WHO-prequalification without winning a tender (ibid). This raised the question of whether WHO-prequalification is necessary for African pharmaceutical manufacturers (ibid). Some pharmaceutical players are now calling for strengthening of local regulatory authorities instead on increasing certifications by imposing WHO-prequalification on the local companies (ibid). As discussed earlier, because generic ARVs are a commodity product, investments in alternative infrastructure and high manufacturing costs militate against local production especially when they compete with finished imports of ARVs.

In the next section, I turn to industrial and development policy incentives.

7.3.3 Industrial and development policy incentives

A Zimbabwean development economist, argued for industrial policy in Zimbabwe's manufacturing sector and remarked;

"If nothing is done in Zimbabwe to safeguard and promote manufacturing then Zimbabwe will become a nation of traders" (Executive Secretary, Economic Think Tank, August, 2011).

This was a very revealing statement considering Zimbabwe was hailed as the next industrialising country in the 1990s (Phimister, 2000; Stoneman, 1990).

Challenges to pharmaceutical manufacturing are myriad for an industry producing a commoditised product that can be imported faster and cheaper than the local industry can manufacture it (Marketing Director, 2011). The local manufacturer has to contend with direct costs, indirect costs and invisible costs as well as policy, practice, and business environmental factors (ibid) (see chapter 5). Industrial policy was the key issue raised by the pharmaceutical players as an area that government should use to push for industrialisation as illustrated in the remark below:

> "Right now companies like Ranbaxy have no intention of producing here, this is a destination of finished products. It is only in South Africa where Ranbaxy and CIPLA have now started doing deals. Here there is no reason for them to do that because the industrial policy and all the other policies don't support that [manufacturing]." (Consultant, Pharmaceutical Industry, 2011).

Zimbabwe had no clearly enunciated and publicised industrial policy from 1980 until 2010. Industrial policies were embedded in national development policies (Director, Policy Studies, 2011). To their credit, the Zimbabwean Ministry of Industry and Trade in the 2010 Industrial Development Policy, identified pharmaceuticals as one of the key industries that can quickly turn around and contribute to economic growth (ZIDP, 2010). The policy was however criticised by some industrialists for setting unrealistic targets, such as establishing an Industrial Development Bank (Executive Secretary, Economic Think-tank, 2011). On the way forward, there was unanimity in the need for protection of nascent industry in Zimbabwe to encourage development of the pharmaceutical industry (Executive Secretary, Economic Think-tank, 2011; Managing Director 1, 2011; Marketing Director, 2011). A pharmaceutical industry executive remarked as follows on the need for intervention and protection by government through policy:

"I think there needs to be a deliberate policy by government to say for the next 5 years we will give some; I know protectionism is a dirty word now, but we need to get some form of protection because of where we have come from. So that we can catch up with the rest of the world and compete with everybody." (Marketing Director, 2011).

What is interesting in the quote above was attributing the "dirty word" status to industrial policy in developing countries, reflecting the non-interventionist approach from the liberalisation of economic structural adjustment era in the 1990s. A development economist was more direct in his approach and argued for protection for developing countries as illustrated below:

"When it comes to issues of development and opening up of the economy you have to be very careful. You have to analyse the state of your own development and your economy, particularly your industry. You cannot just open up overnight, you end up being a market for others, a country of traders." (Executive Secretary, Economic Think Tank, *2011).*

The challenge in protecting nascent industry in Zimbabwe is a fragmentation of policy and a silo approach to development (Managing Director 1, 2011). Policies that should be coherent and augmenting often conflict because ministries have competing priorities and agendas (ibid). An example is policy conflict and fragmented approaches between the Ministry of Industry and Trade and the Ministry of Health and Child Welfare as reflected in the remark below:

"But you know every time that you go, you talk to different people. If you talk to the guys in Industry [Ministry of Industry and Trade] they will be sympathetic. But if you talk to the guys in Health [Ministry of Health and Child Welfare] they will tell you, look I have a budget of a few millions and I have so many people with HIV/AIDS who would want HIV/AIDS drugs. So why should I buy from you when I am going to end up with

less dosages available for the population that I want to save?" (Managing Director 1, 2011).

The quote reveals that health policy is geared to procuring cheaper drugs for as many patients as possible in a resource-limited environment even if it means undermining the local pharmaceutical industry. Policy conflict is thus a major drawback for the pharmaceutical industry in Zimbabwe as further illustrated in the following remark by a pharmaceutical industry executive:

> "Yes it is [policy] an area of major weakness, and we have been trying to lobby [as the pharmaceutical manufacturers association] so that can be sorted out. One thing is that there is inherent conflict between industrial policy and health policy." (Managing Director 1, 2011).

What exacerbates the policy conflict is lack of budgetary support for public health systems; especially public health drug procurement (ibid). This partly explains why public health procurement policy is driven mainly by price considerations and not supporting local pharmaceutical manufacturing capability as illustrated below:

> "The other major hindrance has been our national drug procurement system. It is solely driven by price. What that entails is you will find that a local company having invested so much into coming up with such a formulation you might not get the business." (Marketing Manager, 2011)

Until such a time that resources for the health system are home-raised and accompanied by local procurement preference policies, then it seems impossible for public health drug procurement to be leveraged as an industrial policy tool to support local pharmaceutical manufacture of ARVs (ibid). This is in contrast to the promises by government that 75% of all ARV production would be bought by government for the public health system and 25% reserved for export when government resources were not limited (Osewe *et al.*, 2008; UNIDO, 2011b).

What emerges from this discussion is that there are few policy incentives for local manufacturing of drugs (except for the 10% local preference on tenders). One of the major challenges is policy conflict and a fragmented approach to supporting local pharmaceutical manufacture. This does not augur well for pharmaceutical companies as attractive credit candidates.

7.4 Conclusion

In this chapter, I set out to address research question 5: What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe? The focus was to elucidate some of the business and operating environmental factors that affect the perception and appetite of financiers to invest in local ARV manufacture in Zimbabwe. I used Lall's (1992) technological capability framework, concentrating on the national technological capabilities to discuss issues around physical infrastructure, human capital, incentives, and policy terrain. It emerged that pharmaceutical companies are forced at firm level to compensate for national level capability failure by investing in alternative (complementary) infrastructure such as standby generators and boreholes. On human capital both pharmaceutical companies and banks face serious challenges because of the economic melt downturn that caused skills attrition. Banks they lost the "old-timers" and other financial institutions such as merchant banks, finance houses and discount houses that were critical for financial systems efficiency. Pharmaceutical companies lost experienced pharmacists, analytical chemists, and microbiologists; skills critical for product and process innovation. Pharmaceutical companies also failed to access offshore long-term loans, because of lack of project finance skills. Consequently, their capability to synthesise robust project finance proposals is compromised. The local accounting and audit board acknowledged the decline of accounting and finance skills. The implication for access to finance of lack of accounting and finance skills is enormous. On competition, the local ARV manufacturing company does not currently have local competitors but it is severely incapacitated because the promised off take of 75% of ARV

manufacture by government is not forthcoming because of limited public health resources. In terms of international competition, even with a WHO-prequalified status, the tendering process has not been as successful as initially intended because for a commodity type product like generics the competition is based on prices. In the region South Africa has imposed a non-tariff barrier by insisting that imports into the country come in by air. If the company needs to export into South Africa, it has to pair-up with a South African pharmaceutical company. Lastly, it emerged that there is policy conflict as different ministries have competing goals. The above situation demonstrated practice and policy gridlocks as national level technological capabilities force firm level compensatory intervention. All these factors when combined project a complex picture that makes it difficult for financiers or investors to look favourably at local ARV manufacture as the companies are paddling furiously in a bog.

Chapter 8: Analysis: What do we know now, and what does it mean?

8.0 Introduction

In chapter 1, I argued that financing of local pharmaceutical manufacture in Africa is the elephant in the room that debates on local drug manufacturing ignore or skirt over. I argued that it is not just about getting money, but there are technological capabilities and complexities surrounding access to finance by pharmaceutical companies. I also argued that at financial institutions there are capabilities and expertise involved in loan origination. I followed Lall (1992) who posited that technological capability improvements need efficient financial systems to garner financial resources for physical investment. On this basis, finance, especially long-term finance is critical for technological capability upgrading and innovation take-off. However, very few African studies have focused on the link between finance and technological capability upgrading that fosters innovation take-off especially in African pharmaceutical manufacture.

In chapter 2; the first portion of literature survey, I presented a brief background on African financial systems and pharmaceutical manufacturing, and discussed challenges to financing technological capability upgrading caused by relatively underdeveloped financial systems and over-reliance on FDI and foreign loans for industrial development. I discussed Zimbabwe's political economy, the rise of manufacturing, financial systems, financing of enterprises, local pharmaceutical manufacturing, and the story of ARV manufacture. In chapter 3; the second portion of literature survey, I built the theoretical framework for the study, using economic, social, and financial history literature to understand sources of finance for industry historically. This set of literature revealed that internal finance was used to set up enterprises, and banks were the most prevalent source of external finance for growth in addition to

retained earnings. I discussed the pecking order theory to explain how companies choose external sources of finance, when internal funds are limited. I also discussed trade credit as a key source of external in-kind short-term finance from goods suppliers. To explain what banks do and how they do it, I used contemporary banking and financial intermediation theory. The final strand of literature I used from innovation studies was Lall's (1992) technological capability framework. This eclectic collection of literature reflects the complexity of this study which sits at the interface of finance and innovation, focusing specifically on external finance from banks and firm level technological capability upgrading that fosters innovation take-off. I argued that using a finance lens within an innovation (technological capability upgrading) framework could better unravel the complexities surrounding financing of ARV manufacture in Zimbabwe.

In chapter 4, I discussed the methodology; how I designed the study, collected data, and analysed the data. I also discussed why I decided to use the case study and multiple methods to collect data, and how I leveraged my knowledge of Zimbabwe, the banking sector and the manufacturing sector to gain access to the pharmaceutical and banking sector. In chapter 5, I presented empirical evidence from pharmaceutical companies' perspective on financing ARV manufacture in Zimbabwe. I addressed research questions 1, 2 and 3, which sought to unravel sources of finance for capital investment and working capital finance for ARV manufacture and the technological capabilities at pharmaceutical companies critical for accessing finance for technological capability upgrading and innovation. In chapter 6, I presented empirical evidence from the banks' perspective addressing research questions 1, 2, 3 and 4, which specifically sought to unearth the capabilities and expertise involved in loan origination and the politics of lending as an additional explanation for African financial institutions' low lending rates, high interest charges, and high interest spreads. In chapter 7, I presented empirical evidence addressing research question 5. I discussed how failure of national level technological capabilities covering capabilities, incentives, and

human capital influenced the business and operating environment that determine financiers' perception and appetite for local pharmaceutical manufacture risk.

In this chapter, I consolidate the in-situ analyses in chapters 5, 6 and 7. I answer the why questions on the empirical findings to bring light to what we know now about the technological capabilities and complexities surrounding financing of local pharmaceutical manufacture and what it means for local drug production. I also discuss what is new that this study contributes to knowledge. Finally, I discuss the implications for technological capability and innovation take-off for pharmaceutical companies in Zimbabwe and African local pharmaceutical manufacturing.

8.1 Unravelling Complexities Surrounding Financing of ARV Manufacture

This study on financing of ARV manufacture in Zimbabwe is pioneering work at the interface of finance and innovation, focusing on complexities and technological capabilities surrounding financing of ARV manufacture in Zimbabwe. The work provides new empirical data on the link between finance and the slow technological capability upgrading in local manufacture of ARVs in Zimbabwe. The purpose is to broaden debates on African local pharmaceutical manufacture and innovation take-off. The focus is on current sources of finance for working capital and capital investment and possible future sources of finance for the pharmaceutical industry in Zimbabwe. In addition to shedding light on sources of finance for working capital and capital investment finance, the study contributes empirical data on the politics of lending thesis, offering additional explanations to moral hazard and adverse selection on why Zimbabwean banks lend so little at high interest rates and high interest spreads. The last contribution pertains to policy and practice gridlocks that complicate business and operating environments that affect ARV manufacture and consequently their financing. I arranged the analytical chapter as follows (see

Table 42): In section 8.2, I analyse capital investment financing for acquisition of machinery and equipment (the hardware of technology) in an integrated manner looking at sources and cost of finance. I also explore why long term finance is scarce in Zimbabwe. In section 8.3, I analyse working capital finance in the same integrated manner.

In section 8.4, I discuss the politics of lending and propose it as an additional explanation to Zimbabwe's low bank lending to enterprises and why there are high interest rates, and high interest spreads. I propose the politics of lending as an additional explanation to the traditional adverse selection and moral hazard theses. In section 8.5, I analyse project finance capability at pharmaceutical companies critical for accessing long-term finance to import plant, equipment, and machinery from regional banks. I also analyse the expertise and skills at banks required for loan origination and map them to Lall's (1992) firm level technological capabilities that were originally proposed for the productive firm. In section 8.6, I focus on policy and practice gridlocks and in section 8.7 I discuss the implications for technological capability upgrading and innovation take-off and conclude the chapter with section 8.8.

Table 42: Setup of the analytical chapter, research questions addressed, areas of analysis and chapters from which empirical data is drawn.

Main Research Question	Sub-Research Questions	Area of Analysis	Empirical Data Drawn From
How is local manufacture of ARVs in Zimbabwe financed?	**1.** How is capital investment and working capital requirements for ARV research and development, and manufacture financed?	**8.2** Capital Investment Financing and **8.3** Working Capital Financing: The role played by Commercial Banks integrated in both **8.2** and **8.3**	Chapters **5** and **6**
	2. As the most prevalent source of external finance for enterprises, what role did commercial banks play in financing ARV manufacture in Zimbabwe?		Chapters **5** and **6**
	3. At firm level, what technological capabilities are required for pharmaceutical companies to apply (access??) for finance and for banks to assess and advance loans?	**8.5** Firm Level Technological Capabilities Surrounding Financing of Local Pharmaceutical Manufacture.	Chapters **5, 6** and **7**
	4. What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?	**8.4** The Politics of Lending.	Chapter **6**
	5. What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?	**8.6** Policy and Practice Gridlocks	Chapters **5, 6** and **7**

8.2 Capital Investment for ARV Manufacturing in Zimbabwe

Companies saved foreign currency earnings from donor-funded tenders, sometimes over periods as long as three years, to purchase production machinery and equipment from Indian and Chinese suppliers (see chapter 5). Analytical equipment was procured from Japan and Germany suppliers (Managing Director 1, 2011). Thus, pharmaceutical companies relied on internally generated funds for capital investment as banks played no role in capital investment financing for ARV and other drug manufacturing operations (see chapter 5 and 6).

The use of internal finance for capital investment by pharmaceutical companies is a perverse fit with the pecking order theory. As discussed in section 3.4, companies prefer to use internal finance first, and in the event that internal funds are limited; the first choice of external finance is debt-finance followed by hybrid bonds with the last resort being equity finance (Myers, 1984; Myers and Majluf, 1984). The perverse fit with theory for the pharmaceutical companies is driven by scarcity of long-term finance; whether debt-finance from banks, hybrid bonds or equity finance in Zimbabwe. This brings to the fore the earlier argument in section 3.6 that Lall (1992) omitted project finance capability when he in a sense assumed the existence of efficient financial systems for garnering financial resources for physical investment. Zimbabwean pharmaceutical companies however, used internal finance for capital investment because of an inefficient financial system and an inability to garner external financial resources for physical investment locally. The financial system inefficiency could, however, be argued to have been exacerbated by the unstable macroeconomic environment that persisted over the last decade. What is indisputable though is that even though Zimbabwe was reported to have a developed financial system, it did not historically finance industrial development (see chapter 2). Industrial development was funded by FDI and foreign loans when British and South African multinational corporates set up operations in Zimbabwe (see chapter 2). Enterprise growth was financed by locked up capital due to the sanctions and capital and foreign currency controls instituted by the government post the 1965 unilateral declaration of independence according to Bond's (1993, 2000) capital lock-up thesis.

There is a critical dichotomy in capital for industrial development that was identified by Dailami and Walton (1989). This dichotomy exposes the shortcomings in current arguments for why banks are not lending long term. As discussed in chapters 6 and 7, some banking executives argue that they do not lend long term because they do not have savings. Consequently, some bankers are calling for national savings in the magnitude of 25% of GDP to finance industrial development. Dailami and Walton (1989) complemented the Zimbabwean financial system for having elevated levels of domestic savings. The African Development Bank (AfDB, 1998) also confirmed the vibrancy of the Zimbabwean commercial banks and merchant banks in raising domestic resources, and competing in the short and long-term arena (see section 2.6 and 2.7). Dailami and Walton (1989) however, argued that it was not the domestic savings that limited financing of industrial development, but lack of foreign currency to import plant, equipment and machinery (ibid). This raises a critical issue that many African countries face; access to foreign currency long-term loans to import technology. Domestic savings are important; however, for importation of capital equipment, foreign currency is required which leads to the need for the country to generate foreign currency. This situation persists today and even though Zimbabwe is using a basket of foreign currencies, the country still needs to export, and earn foreign currency to enable importation of technology. Even where financial institutions can structure offshore finance loans for local companies, they still need foreign currency to repay the loans. The argument of lack of savings to finance long-term industrial requirements only stands for local needs; however, when it comes to importation of plant, equipment, and machinery foreign currency savings are more critical than domestic savings. This is caused by the required technology (equipment and machinery) not being fabricated locally with the only sources of the equipment and machinery being outside the country. If local fabricators and toolmakers could reverse engineer or manufacture under license manufacturing and analytical machinery and equipment, then reliance on foreign currency for technology imports could be reduced.

For as long as the pharmaceutical companies need to import plant, equipment, and machinery; project finance capability is a critical requirement for technological capability upgrading. It

assumes even greater importance when pharmaceutical companies have to rely on regional banks that possess little local knowledge. Zimbabwe's support for long-term foreign currency loans currently is from the African regional banks, Afreximbank, PTA Bank and possibly the African Development Bank. The Afreximbank-Government of Zimbabwe ZETRAF facility (see chapter 6) is an institutional arrangement innovation that provides a window into understanding possible sources and forms of industrial development finance for Zimbabwe and African in general, where local foreign currency savings are limited. The institutional arrangement innovation leverages resources from wealthier geographies as African regional and development banks with good credit ratings borrow from for example, the Eurobond market and on-lend funds through local commercial banks for industrial recapitalisation (ibid). The African regional financial institutions shoulder the "Africa risk" by taking on foreign currency risk, country risk, political risk and credit risk amongst other risks (ibid).

Zimbabwe's financial system does not currently have the foreign currency resources to finance capital investment through debt finance, bonds or hybrid bonds even equity finance (see chapter 6 and 7). This presents key challenges to financing technological capability upgrading through importation of plant, equipment, and machinery. Thus, the calls for increasing local savings by banking executives and policy makers are legitimate; however, there is a need to realise that local savings will only support local long-term requirements. Where the pharmaceutical sector needs to import plant, equipment, and machinery, they need long-term foreign currency loans. The local financial system is unable to provide these long-term foreign currency resources. A possible window of opportunity has been availed by an institutional arrangement innovation. Afreximbank in partnership with the Ministry of Finance has provided the 'patient capital' for industrial recapitalisation. This window of opportunity and also if the pharmaceutical companies need to deal directly with offshore financiers, makes project finance capability key for technological capability upgrading and innovation take-off.

I now turn to short term financing of day-to-day operations.

8.3 Working Capital Finance for ARV Manufacturing in Zimbabwe

Working capital requirements for ARV manufacture were financed by bank finance and internal finance. The cost of bank finance was very high; on average interest rates range from 16% to 30% per annum for industry although one company is paying between 14 and 18% (see section 6.3). The banks charge high interest rates, whilst they pay no interest for deposits, save for a few companies that negotiate for deposit interest rates. This explains the high interest spreads observed in African financial institutions lending to enterprises. The banks win both ways; they pay little deposit interest and charge high lending interest rates. In addition, banks short-date lending facilities and collect management fees more frequently on renewal of the credit facility (see section 6.3). Pharmaceutical companies, wherever possible, would rather use internal funds for working capital to minimise expensive bank charges and onerous security requirements.

These findings conform to other African bank lending to enterprises studies which show that generally commercial banks are dominant, prefer to lend short term finance, charge high interest rates, and enjoy huge interest spreads (Andrianova et al,, 2010, 2011a, 2011b; Allen et al., 2011; Beck and Hesse, 2009; Beck et al., 2009, 2011; Mugizi et al., 2009; Nissanke, 2001). The phenomenon is also not new to Zimbabwe as the study confirms Chigumira and Masiyandima's (2003) findings. The situation though has become acute on the back of low savings mobilisation and banks preferring transactional banking to traditional lending (see section 6.5.2). Carmody (1998) argued that financial liberalisation in Zimbabwe resulted in tight credit policy, higher interest rates, devaluation, and higher inflation. These findings are reflected in my study as persisting to date with a negative effect on access to finance, investment strategies, and productive capacity expansion.

Hyperinflation wiped away generations of savings, consequently dominant deposits are now of a short-term nature, and medium and long-term deposits are non-existent; at least since the advent of

hyperinflation. Consequently, in the current scenario characterised by macroeconomic and political instability and unpredictability, banks are holding hot deposits (transitory short-term deposits), and risk, liquidity and maturity transformation activities are problematic as banks juggle liquidity and lending (see section 6.5.2). This pushes up the cost of money or the deemed cost of money. Savers hold back from entrusting their savings to financial institutions and would rather transact on cash basis because of high bank charges (dis-intermediation) and risk of their money being locked up in the event of a policy change. The currency in circulation through formal financial institutions is estimated to be as low as one third with savers prefering to play it safe and keep their money (see chapter 6).

Working capital financing by local financial institutions has historically not been as problematic as capital investment. However, the issue of foreign currency is also prevalent in working capital financing. This is especially so for pharmaceutical manufacturing companies that import all their APIs, excipients and certain packaging material. The imported components require access to foreign currency, and with Zimbabwe's low import cover, foreign currency is a persistent challenge. In the past, the Reserve Bank of Zimbabwe allowed exporters to retain certain portions of their exports for own use, provided they used the foreign currency within a certain period (see chapter 5). However, this had its own bureaucracy problems. Domestic savings can cover financing of local requirements such as wages, utilities, and raw materials available locally; however, key drug ingredients such as APIs and excipients require foreign currency. In the current multi-currency regime, this issue has been temporarily masked, but it will eventually resurface if or when Zimbabwe reverts to a local currency. The fact that foreign currency is required for working capital and capital investments, inevitably leads to a fight for resources between the two financing requirements. Companies have to balance acquisition of equipment and machinery with day-to-day operations, with the inevitable consequence that there is no financial breathing space to effectively fund technological effort and innovation. An inability by the companies to leverage trade credit terms from suppliers makes the situation more acute. I now turn to lack of trade credit in the next section.

8.3.1 Trade credit: the missing link

Trade credit is not available from API and excipient suppliers; key raw materials that constitute the bulk of manufacturing costs (70 to 80%) for ARV manufacture (see section 5.2.1). The companies finance Indian and Chinese suppliers because they do not have bargaining power with suppliers as they purchase small quantities of APIs and excipients. Financing Indian and Chinese suppliers by Zimbabwean pharmaceutical companies is similar to a perverse subsidy discussed by Mackintosh (2009), where the developed world benefits from the developing world. By financing their suppliers and buyers, the resultant cashflow squeeze forces local pharmaceutical companies to resort to expensive bank finance characterised by high interest rates, multiple management fees, drawdown fees per year and onerous security requirements (see chapter 5). Both legs of buyer finance and supplier finance are a financial drain on the companies, contributing to higher manufacturing costs and ultimately uncompetitiveness of locally manufactured products. It has not always been like this in Zimbabwe. Enterprise finance studies by Dailami and Walton (1989), Carmody (1998), Fafchamps *et al.,* (1995), Chigumira, and Masiyandima (2003) reveal that trade credit was a significant source of external in-kind finance to enterprises. Macroeconomic and political instability; key environmental determinants of foreign currency risk, interest rate risk and country risk amongst others are acting as disincentives for technological capability upgrading.

Trade credit, according to trade credit theory, is a critical source of funds for small to medium enterprises that do not have access to vast bank finance, but benefit from suppliers with access to bank finance that in turn advance them credit in the form of goods (see section 3.2.4). Dearth of trade credit from API and excipient suppliers seems peculiar to Zimbabwe only, as East Africa pharmaceutical companies access and leverage trade credit from their suppliers (see chapter 5). If it is a transitory phase, no doubt the local pharmaceutical companies will leverage the return of trade credit in addition to the in-country bonded warehouse being pursued (see chapter 5).

In the next section, I turn to the politics of lending as an additional explanation for why Zimbabwean banks lend so little at high interest rates and huge interest spreads.

8.4 The Politics of Lending

Financial institutions' credit policies, underwriting standards, capital utilisation strategies and risk-reward remuneration policies affect the availability of credit to the pharmaceutical industry (see chapter 6). Credit policies and underwriting standards which favour short-term working capital financing, and revenue strategies that prefer non-interest incomes to interest (risk) incomes affect access to credit for local pharmaceutical companies (see section 6.5). For banks, these policies at micro level caused the gradual de-emphasis of merchant banks and the rise to dominance of commercial banks; shrinking a critical development space for capital investment financing as the financial system became short-termist, preferring to finance trade and commerce at the expense of capital investment. Building in the politics of lending; institutional policies and behaviour with respect to credit policies, underwriting standards and revenue stream strategies, one gets to understand why banks lend less and emphasise transactional banking (non-risk revenue stream) over traditional banking (risk income stream) (see section 6.5).

The theory of financial intermediation (see section 3.5) proffered asymmetric information, brokerage services, qualitative asset transformation and risk, maturity and liquidity transformation as the key functions of financial intermediaries. In Zimbabwe, banks are holding hot deposits (transitory short-term/demand deposits) that can be claimed at any time. Consequently, liquidity, maturity, and risk transformation assumes a higher risk profile. There is therefore reluctance by banks to engage in unrestricted qualitative asset transformation activities and lend generously to enterprises. The scarcity of local savings drives tight credit policies as banks worry about the liquidity of their operations. The focus is on preserving liquidity to safeguard against a run on the bank and reputational risk in the event all depositors claim their liquid deposits when the banks

have transformed then into illiquid loans (see section 3.5). Some international banks take a tempered approach to lending while some local banks do back-to-back deals where they match the tenor a specific deposit (liability) to a specific loan (asset). By matching the maturity profiles, they minimise maturity and liquidity risk. However, this approach even when added to using a certain core balance of deposits by local banks, results in a form of credit rationing as the financial system is not functioning efficiently. International banks though (see chapter 6) are clearly steering away from lending, preferring transactional banking instead.

Bank ownership seems to drive revenue strategy, especially for foreign-owned banks. Non-funded income is taking prominence over risk income (lending income) for international banks. They prefer that non-funded income from non-risk based activities cover operational costs. This promotes transactional-based banking activities and relegates lending business to a lower rank (see section 6.5). The bankers argue that lending activities, considering risk weight adjusted capital measures consumes capital, and are too risky in the current macroeconomic environment. The theoretical underpinnings for preference of transactional banking over traditional lending is driven by a preference for brokerage functions whilst shying away from qualitative asset transformation that involves risk, maturity and liquidity transformation (see section 3.5). This revenue model that favours transactional banking over direct lending, driven by institutional policy, is implicit credit rationing. It encourages managers to prefer transactional services to lending as performance appraisals and hence bonus and remuneration are linked to how they conform to policy.

Ultimately, these policies affect allocation of credit to pharmaceutical companies, which in most countries fall in the locally owned, small to medium enterprises spectrum and require heavily weighted lending products (overdrafts and loans). An institutional policy at a micro level rations credit via capital utilisation strategy and risk-reward metrics. This may be one of the explanations for Allen *et al's.*, (2011) findings, that average credit extended to the private sector in Africa was 15% of GDP compared to 28 to 45% for other developing regions, in addition to the classical moral hazard and adverse selection explanations for low lending in Africa.

The second issue on politics of lending relates to borrower company ownership. Foreign owned banks are inclined to favourably consider subsidiaries of multinational companies (MNCs) compared to local companies. This is especially so for globally relationship managed subsidiaries of MNCs.[26] Subsidiaries of multinational corporates, have greater chances to access credit compared to locally owned companies because of credit assessment tools setup in banks which give better credit rating grades to subsidiaries of MNCs with support from the parent company (see section 6.5). This assessment and analytical bias debilitates locally owned companies in competition for financial resources. The credit score or credit grade determines the premium charged on interest, consequently locally owned companies are likely to pay higher interest premiums, management fees, and transactional fees compared to subsidiaries of multinational corporations (see section 6.5). Considering that pharmaceutical companies in Zimbabwe are locally owned, credit policy might be a hurdle to access to financing. As discussed earlier, credit scoring is skewed in favour of foreign owned companies with a letter of comfort, letter of support or guarantee from the parent company (see section 6.5). Bankers argue that this covers settlement risk, country risk, currency risk and to a certain extent credit risk. Banks further argue that the parent company could easily second both technological and management expertise in the event the local subsidiary is threatened, and meet financial obligations to avert reputational risk.

Long-term policy predictability considerations by banks are some of the major hurdles to the long-term perspective required for long-term financing. The lack of macroeconomic and political stability and predictability backed by long-term policy announcement giving industry adequate time to plan, prepare, and execute strategies are challenges faced by industry in Zimbabwe. Combining macroeconomic and political instability with policy unpredictability in an environment exhibiting elevated country risk, and reputational risk, it becomes clear why there is hesitancy to lend long-term.

Another financial institutional policy that affects access to finance for local pharmaceutical companies is market segmentation (see section 6.4.1). Locally owned pharmaceutical companies

[26] Interviews held in Zimbabwe and practice as a banker with an International bank working in both corporate and retail banking units.

usually fall into the small to medium enterprises (SME) segment, and for a number of banks this sector is managed in retail banking divisions and not corporate banking units. This results in allocation of less experienced Relationship Managers and lower credit lines; an implicit credit ration approach.

Preference for transactional banking over traditional lending, MNCs over local companies, and commission and fee incomes over risk income also offer an additional explanation to why African countries lend so little. The politics of lending thesis augments the moral hazard and adverse selection of why African banks lend so little at high interest rates and exhibiting high interest spreads (see for example Andrianova *et al.*, 2010, 2011a, 2011b; Allen *et al.*, 2011; Beck and Hesse, 2009; Beck *et al.*, 2009, 2011; Mugizi *et al.*, 2009; Nissanke, 2001). This is one of the theoretical contributions of this thesis to knowledge.

I now turn to technological capabilities and complexities surrounding financing of ARV manufacture in Zimbabwe.

8.5 Technological Capabilities Surrounding Financing of Local Pharmaceutical Manufacture

In this section, I analyse empirical findings from chapters 5, 6 and 7 that address research question 3 where I sought to unravel the technological capabilities at pharmaceutical companies surrounding financing of ARV manufacture in Zimbabwe. I also sought to understand the expertise and capabilities involved in loan origination at banks. These technological capabilities and expertise constitute some of the complexities surrounding financing of local drug production that I argued have been neglected in debates on African local pharmaceutical manufacture. There are technological capabilities at pharmaceutical companies required to access financial resources and there is expertise and knowledge involved in loan origination at banks. In section 8.5.1, I focus on

technological capabilities at pharmaceutical companies required to access financial resources for physical investment and day-to-day operations. In section 8.5.2, I turn to the expertise and capabilities required for loan origination at banks.

8.5.1 Technological capabilities for accessing project finance by pharmaceutical companies

For the pharmaceutical sector, I focused on project finance capability critical for accessing financial resources for physical investment. In section 3.6, I argued that Lall (1992) by indirectly assuming the existence of efficient financial systems omitted project finance capability, which is required by the productive firm to access financial resources for technological capability upgrading and innovation. Project finance capability as I argued in section 3.6, is the operative link between banks or other sources of finance and firm level investment capability. Project finance capability is important as it pervades all the technological capabilities of investment, productive and linkages, and it also relates to national level capabilities. Project finance capability is an on-going requirement for the productive firm and the services firm. All the other technological capabilities; investment, productive and linkages, require financial resources for their operation and improvement, making project finance capability a key issue for non-cash rich pharmaceutical companies in developing country contexts.

Without access to foreign currency long-term loans, Zimbabwean pharmaceutical companies depended on internally generated funds to finance capital investment. This is a very slow process as it depends on how long it takes to accrue savings to purchase a piece of equipment (see chapter 5). They could not access offshore finance because they lacked of project finance capability (see chapters 5, 6 and 7). Finance personnel and executive management need project finance capability and internal linkages with production, quality control, and research and development personnel to be able to develop a robust and fundable project finance proposal (see section 5.5). Addressing the project finance capability deficiencies requires concerted effort by pharmaceutical companies and

national training institutions, and should not be viewed from a silo approach but a systems approach. At national level, the Public Accounting and Auditing Board acknowledged that finance and accounting skills have declined in Zimbabwe (see section 5.5). This recognition at national level may imply that accounting and finance skills challenges pervade the whole economy and hence my argument for a systems approach in redressing the accounting skills, finance skills, and project finance capability. Skills scarcity also affected research and development, and production functions, retarding technological effort and innovation (see chapters 5 and 7).

Lack of project finance capability hampers access to capital investment financing from offshore sources. Capital investment funding from own resources is not sustainable and does not build the critical mass to effect meaningful technological capability upgrading. This obviously has serious implications for technological capability upgrading and innovation for the pharmaceutical sector. Purchasing affordable, and not state of the art machinery and equipment, delays the build-up of efficiencies and economies of scale (see chapter 5).

In addition to project finance capability, pharmaceutical companies failed to leverage linkage capabilities for technology transfer from Indian and Chinese suppliers through staff exchanges (see chapter 5). They are failing to exploit a cheap way to effect technology transfer. The second evidence of failure to use linkage capability is not trying out a local company AIBST for bio-equivalence studies as it claims to be cheaper than Indian CROs. This has monetary consequences and also retards the deepening of local industry structure through backward linkages. The third evidence of lack of linkage capability is failure by pharmaceutical executives to establish professional and personal links with executives in the financial services sector; however, for the same reason, financial services executives have also failed in their linkage capabilities. Executives in the financial institutions openly acknowledged their lack of knowledge of the pharmaceutical sector. Exploitation of linkage capabilities by both sectors could reduce the current acute information asymmetry, and improve business and industry risk analysis during the loan

origination process at banks, and also improve project finance capabilities at pharmaceutical companies.

In order to access financial resources for physical investment, pharmaceutical companies need to upgrade their project finance and linkage capabilities. Lall (1992) recommends firm level investment in training if national technological and training institutions are not producing the skills required. Pharmaceutical companies may therefore need to invest in training of their finance and other executives in project finance and project management.

8.5.2 Capabilities and skills surrounding loan origination at banks

In chapter 1, I argued that it is not just about money but there are complexities and technological capabilities surrounding financing of local pharmaceutical manufacture. I also argued that there has been a tendency to keep finance literature separate from innovation literature, and consequently I positioned this study at the interface of finance and innovation. I argue that Lall's (1992) technological capability framework could be mapped across to the services firm. In section 6.4 and Table 6.6, I proceeded to do this and demonstrated that Lall's (1992) firm level technological capability framework can be mapped across to a financial services organisation instead of confining the framework to the productive sectors only. This supports the argument that there are complexities and technological capabilities surrounding financing of local manufacture at the bank (see chapter 1). This is a contribution to knowledge that this study brings, by working at the interface of finance and innovation.

Skills in project finance appraisal for long-term projects have diminished significantly in banks because of the de-emphasis of merchant banks, hyperinflation, and economic collapse, which caused skills flight (see section 7.2.2). There was loss of tacit knowledge (Polanyi, 1966) that leverages transfer of knowledge between old timers and younger generations through social

interaction and apprenticeship (Lave and Wenger 1991). Thus the unintended consequence of the de-emphasis of merchant banking was a loss of skills and tacit knowledge; the know-why, know-how, know-what and know-whom in project finance capability as commercial banks preferred to finance trade and commerce activities at the expense of capital investment. Some of the skills lost include the appreciation of the operation and application of lending technologies for financing technological capability upgrading in industry (see chapter 2 and 6).

To reiterate the impact of loss of skills, bankers, from executive level to analysts admitted that they did not understand the pharmaceutical industry, especially ARV manufacture (see section 7.2.3). This poses a serious challenge for local financing of pharmaceuticals by local financiers both from a risk assessment perspective and from risk pricing (interest margin). Some of the senior banking executives were not even aware that ARVs have been manufactured in Zimbabwe since 2003. If they do not understand the industry, how then do they fairly price their risk? Industry knowledge; know-who, know-what and know-why (Ernst and Lundvall, 1997), project finance capability and linkage capability are key issues that need to be addressed by financial institutions. The risk, if they do not understand the industry, is they could classify everything as high risk and steer clear of financing the industry.

I now turn to policy and practice gridlocks. The policy and practice gridlocks discussed are different from the policy gridlocks discussed by for example Skolnikoff (1990), Peake (2002) or Feldman *et al.*, (1994) which deal with the process of instituting policy through government. The perspective taken on gridlocks in this discussion is from an engineering point of view of traffic gridlocks (Mugwagwa *et al.*, 2013). Gridlocks thus occur due to policies opposing each other, or in other instances national policy failure causing a compensatory reaction at micro policy level.

8.6 Policy and Practice Gridlocks

Research question 5 was concerned with the key business and operating factors that influenced financing of ARV manufacture in Zimbabwe. I followed Lall's (1992) national level technological capabilities framework to discuss these factors under capabilities, and incentives (see chapter 7). Policy and practice gridlocks emerge as failure at national technological capability level elicits a compensatory response at firm level, congesting the policy and practice space. In this section, I discuss some of the hindrances to funding ARV manufacturing emanating from policy conflict, policy misalignment and in some instance absence of an enabling policy framework. Gridlocks can be caused by policy and practice failures at national level, forcing firm level compensation. These dynamics affect the appetite of local and international financiers to fund local pharmaceutical manufacture in Africa. Table 43 shows the key policy and practice gridlocks that affect the business and operating environment for pharmaceutical companies and banks in Zimbabwe.

8.6.1 Politics of lending

Financial institutions' credit policies, underwriting standards, capital utilisation strategies, and risk-reward remuneration policies affect the availability of credit to the pharmaceutical industry through the politics of lending (see section 6.5). Credit policies and underwriting standards which prefer working capital finance over capital investment finance as well as a preference for transactional banking over traditional lending play a critical role in rationing credit to pharmaceutical companies. Bank policies at micro level gradually de-emphasised merchant banks and led to the over-dominance of commercial banks and this shrunk a critical development space for capital investment through skills and lending technology losses (see chapters 6 and 7).

Table 43: Policy and practice gridlocks faced by Zimbabwean pharmaceutical companies.

Practice Gridlock	Policy Gridlock
Politics of lending: Preference for transactional banking over traditional lending. Preference for commission and fee income over risk income.Preference for MNCs over local companies.	Micro level financial institutions' revenue and business model preference policies work against industrial development policy.
Technological capability: Limited skills in Project Finance Capability and Linkages Capability hampering access to financial resources required to garner financial resources for phsical investment that encourages technological capability upgrading.	National level policies on training resulting in deficient products (finance and accounting skills) and firms have to invest their resources in further training staff. Micro level training policy compensation for national level training policy failure.
Physical Infrastructure: Intermittent supply of electricity and water forced pharmaceutical companies to invest in standby generators and boreholes which result in higher manufacturing costs.	National level policy failure in provision of infrastructure (electricity and water) for industry is compensated for by micro level investment policy resulting in alternative investment in infrastructure such as standby generators and boreholes.
Markets for drugs: Loss of public health procurement as an industrial development policy tool as public health funding is limited. South Africa insists on drugs being airfreighted into the country through O R Tambo International Airport.	Health policy prefers to procure more ARVs from outside the country because of limited resources. Thus health policy conflicts with industrial development policy. South Africa by insisting on airfreighting of drugs is imposing a non-tariff barrier on a regional member of SADC.

Source: Developed by author with input from pharmaceutical and banking executives, 2011.

Using the politics of lending lens and considering institutional policies and behaviours with respect to credit policies, underwriting standards and revenue stream strategies, it becomes apparent why banks hold back from lending and emphasise transactional banking (non-risk revenue stream) over traditional banking (risk income stream). The implication of the politics of lending is an implicit credit rationing as banks prefer to be active only in the brokerage and transactional services and reducing qualitative asset transformation that involves liquidity, maturity and risk transformation. The local pharmaceutical companies, classified as SMEs, fall into a non-priority sector for the well-endowed foreign banks, and firm level underwriting policies implicitly rations credit to the sector (see section 6.5). The dearth of trade credit makes the business and operating environment for

financing ARV manufacture very challenging and can dissuade investors from supporting investment in pharmaceutical manufacture.

8.6.2 Technological capabilities

Lack of project finance capability hampers access to financial resources for capital investment (see chapters 5 and 6). This key technological capability points to failure of national training institutions to produce graduates with the requisite accounting and financial skills. To remedy the situation, firms have to invest in training. Thus failure at national policy and practice levels is being mitigated at firm level policy and practice arenas. Project finance capabilities are also a challenge in the financial sector, which prefers financing trade and commerce as opposed to long term industrial finance. The gridlock comes from all the players congesting the financing of trade and commerce (short-term financing) and no players interested in financing industrial development.

The second practice gridlock comes from bankers and pharmaceutical executives not getting out of their offices to establish key linkages in the economy that would result in the reduction of information asymmetry. This is a practice gridlock caused by a non-aggressive approach to financing local pharmaceutical manufacture. For as long as the executives in the pharmaceutical companies and banks do not aggressively establish linkages in the economy and outside the country for access toforeign currency resources for physical investment, then their lethargy is a practice gridlock that negatively impacts technological effort and technological capability upgrading.

8.6.3 *Physical infrastructure*

Physical infrastructure provision failure through intermittent supply of electricity and water increases cost of manufacturing. Companies are forced to divert scarce financial resources for capital investment by investing in alternative infrastructure (see section 7.2.1). The cost increases come from fuel and maintenance costs for the alternative infrastructure. A failure at macro policy and practice levels on energy and utilities, elicits a firm level (micro policy) investment in alternative infrastructure such as generators and boreholes. This builds inefficiencies and unnecessary costs for local industry and ultimately leads to failure to compete effectively on tenders. This business and operating environment works against the local pharmaceutical company in business and industry risk analysis, especially on infrastructural input costs and stability. These practice and policy gridlocks work against local manufacturing of ARVs in Zimbabwe.

8.6.4 Markets for ARV drugs

Markets for ARVs are critical as they represent the demand side of the financing equation. When the compulsory license was granted, the company was guaranteed 75% uptake by government for the public health sector (see chapter 2). When the country went through the economic turmoil, this guarantee could not be fulfilled and resultantly ART (antiretroviral treatment) depends on donor financing with local resources spend on ART accounting for only 24%. The donor funded programmes are not obliged to procure their ARVs locally. In most cases they procure through their in-house procurement vehicles from mainly India (see chapters 5 and 7). As argued in chapter 5, the loss of public procurement as an industrial policy tool had serious consequences on technological effort and as a result, the industry lagged behind as it is generally manufacturing first line treatment drugs and has not moved to recent second line ARVs which command more returns and are in demand by global health funded programmes.

Policy conflict is also affecting technological effort. Health policy is price driven and prefers to put as many people as possible on ART. As a result they purchase the cheapest drugs on the market. This conflicts with industrial development policy. What causes the high cost of manufacturing are the finance policies that determine customs and duty rates, and taxes as well as investment in alternative infrastructure due to infrastructural failure. It appears the policy framework is uncoordinated, conflicts and results in a practice and policy gridlock that works against technological capability upgrading.

Physical infrastructure failure, lack of supporting strategies for local production, low financial deepening and policy conflict and misalignment have contributed to the pharmaceutical manufacturing sector struggling to access financial resources for physical investment (see section 7.3.3). In terms of business and operating environments, the lack of a coordinated approach to national technological capabilities of institutions and incentives have resulted in local manufacturing being a very costly business through policy and practice gridlocks.

8.7 Implications for Technological Capability Upgrading and Innovation

This study revealed that financial resources for importing plant, equipment and machinery are not available. Historically the country depended on FDI and foreign loans. In the current scenario where FDI has dried up and foreign loans are not available from international banks, industry has been left in a lurch and has to depend on internal funds for capital investment. As discussed in chapter 5, cost of machinery and equipment determines what they buy as they battle to balance working capital requirements and capital investment. Consequently they do not purchase state of the art but cheap machinery, according to the magnitude of their savings. Lall (1992) posited that efficient financial systems to garner financial resources for physical investment are critical for building technological capabilities. However, as demonstrated in this study, the financial systems are not efficient and the requisite financial resources for capital investment are not available. Technological effort is hampered by lack of the research and development equipment, and in

production local reverse engineering is not available. The absence of the equipment retards product and process engineering efforts.

The use of savings, as argued earlier, is a slow process to import technology and it also starves operations of working capital finance and sends the sector into a vicious cycle of basic survival, putting innovation and technological capability upgrading on the back burner. The pharmaceutical companies cannot build economies of scale if they are constantly in a survival mode and juggling allocation of resources between working capital and capital investment as they do not have access to patient capital. The lack of project finance capability forces the company to resort to using internal finance when they could access financial resources offshore.

The politics of lending exacerbates the situation as banks prefer non-lending activities to lending, and charge high interest for loans. This makes working capital finance expensive for the pharmaceutical company, further increasing manufacturing costs. In the event that there is a reversion to local currency, since the companies import all APIs and excipients, they will be exposed to foreign currency risk. Working capital finance is a challenge for the companies as they are unable to access trade credit, a cheap source of external in-kind finance. This further squeezes the company's cashflows and reduces allocation of resources to technological capability upgrading and innovation activities.

Lack of linkages with a local research organisation for bio-equivalence tests as discussed in chapter 5 reduces the chance of deepening local industry through backward linkages, which can be beneficial in building local capabilities. Lack of linkages between pharmaceutical and banking executives has resulted in high information asymmetry between the two sectors. This has resulted in the pharmaceutical sector not accessing information on external source of financial resources for physical investment and knowledge exchange with their financiers to improve on project finance

capabilities. This lack of knowledge exchange retarded technological capability upgrading and innovation.

8.8 Conclusion

In this chapter, I set out to analyse the empirical findings in chapters 5, 6 and 7. In addressing research question 1 on sources of capital for capital investment and research question 2 on the role played by banks, it emerged that capital investment for ARV manufacturing was funded by internal finance, not because the pharmaceutical companies are cash rich but because they could not access external sources of finance. Use of internal finance for capital investment was a perverse fit with the pecking order theory. The commercial banks did not play a role in capital investment, and have not done so historically in Zimbabwe as FDI and foreign loans from British and South African MNCs were used to establish industry in Zimbabwe. The Zimbabwean financial system, however was active in domestic currency long term lending, as argued by Dailami and Walton (1989), but what was lacking was foreign currency to import technology. This situation persists to date.

Working capital finance was provided by banks and through internal finance. Commercial banks played a role in working capital finance. However, consistent with Zimbabwean and African finance literature, they charge high interest rates, enjoy huge interest spreads and do not lend much to local enterprises. The politics of lending provided an additional explanation to adverse selection and moral hazard arguments on why banks lend so little at high interest rates. The politics of lending thesis addressed research question 4.

I unravelled the technological capabilities and complexities surrounding manufacture of ARVs in Zimbabwe. Project finance and linkage capabilities are critical requirements that the pharmaceutical companies require to access financial resources for physical investment. At banks, expertise and knowledge required for long-term finance have been affected by the demise of the

merchant banks and loss of old-timers. Using Lall's (1992) national level technological capability framework, I discussed how policy and practice gridlocks emanate from national level technological capability failure that elicits a compensatory firm level response. I lastly discussed the implications for technological capability and innovation for the pharmaceutical sector. The current trajectory of using savings for capital investment does not promote rapid technological capability upgrading and innovation. There is a tussle for financial resources between working capital requirements and capital investments. This leaves no space for allocating patient capital to technological capability upgrading and innovation activities as the companies are in survival mode.

Chapter 9: Discussion and Conclusions

9.0 Introduction

In chapter 1, I argued that contemporary discourses on African local pharmaceutical manufacture revolved around economies of scale, technology, technology transfer, and human capital, neglecting a critical component; financing of local pharmaceutical manufacture; the first gap in knowledge. Where literature does address financing of African local pharmaceutical manufacture, it is cursory and scratches the surface. This is especially so for long-term finance which is identified as a major hurdle to increasing local productive capacity. Contemporary discourses make it just about getting money from the bank ignoring the complexities surrounding financing local pharmaceutical manufacture. From an innovation and finance interface perspective, there are complexities and technological capabilities as well as expertise and knowledge surrounding financing of African local pharmaceutical manufacturing. Pharmaceutical companies require project finance capability to access financial resources for physical investment. Financial institutions also require expertise and knowledge to assess, approve, disburse, monitor, and control loans disbursed to borrowers. The lack of focus on the complexities, expertise, knowledge and technological capabilities surrounding financing of local pharmaceutical manufacture is the second gap in knowledge that I identified (see chapter 1).

In this chapter, I bring it all together, looking at what I set out to study, what I found, what it means and what the implications for technological capability upgrading and innovation for African local pharmaceutical production are. I discuss the gaps in knowledge I identified in chapter 1, how I set to find out empirical information to fill those gaps, what I found, and how it fills the gap. I also discuss contributions to knowledge that this study makes and conclude by offering opportunities for further research and the limitations that I faced. I set up the rest of the chapter as follows: in section 9.1 I recap the research and in section 9.2 I discuss the key findings by research question. In section 9.3 I discuss the limitations faced in this study and in section 9.4 I discuss the

implications for policy. I turn to implications for theory in section 9.5, followed by opportunities for future research in section 9.6 and conclude the chapter with section 9.7.

9.1 Recap of Research

As mentioned earlier the two main gaps in knowledge that I identified were:

(i) Neglect of financing of local pharmaceutical manufacture in contemporary academic and professional discourses on African local pharmaceutical manufacture (see chapter 1)

(ii) The assumption in contemporary discourses on financing of local pharmaceutical manufacture that is just about getting money, neglecting the complexities and technological capabilities surrounding financing of local pharmaceutical manufacture.

To study the financing of African local pharmaceutical manufacture, I chose to focus on the financing of antiretroviral drug (ARV) manufacture in Zimbabwe. As discussed in chapter 2, the Zimbabwean pharmaceutical sector was set up as early as 1953 and the financial architecture dates back to the early 1890s. From a policy perspective, ARV manufacture commenced on the back of a compulsory license from the government with a guarantee for 75% procurement of all production for the public health system.

9.1.1 The research questions

The main research question for the study was: **How is local manufacture of ARVs in Zimbabwe financed and what are the complexities and technological capabilities surrounding its financing?**

In order to unravel the complexity surrounding financing of ARV manufacture in Zimbabwe I split up the main research question into five research questions as follows:

Research question 1: How are capital investment and working capital requirements for ARV research and development, and manufacture financed?

Research question 2: As the most prevalent source of external finance for enterprises, what role do commercial banks play in financing ARV manufacture in Zimbabwe?

Research question 3: At firm level, what technological capabilities are required for pharmaceutical companies to access finance and the expertise and capabilities at banks required for loan origination?

Research question 4: What institutional factors drive bank strategy on revenue streams, lending, who to lend to and at what price?

Research question 5: What are the key business and operating environmental factors that influence financing of ARV manufacture in Zimbabwe?

9.2 Key Findings by Research Question

In this section, I present briefly the key findings that address each research question and point out which empirical chapters the findings come from. I start with research question 1 in section 9.2.1 and follow through with each of the research questions 2,3,4 and 5 in sections 9.2.2; 9.2.3; 9.2.4; and 9.2.5 respectively.

9.2.1 Research question 1: Chapters 5 and 6

In this section, I discuss the key findings from chapters 5 and 6 that address research question 1. In order to be systematic, I start by addressing capital investment and then move on to working capital investment.

The pharmaceutical companies did not seek capital investment finance for ARV manufacturing as separate project finance. For the ARVs they are currently manufacturing, they do not need ARV specific machinery. Consequently, they purchase capital equipment of universal utility (see chapter 5). Capital investment was financed by internal funds, cross-shareholder loans and in one instance by an international organisation; UNDP. Varichem received USD 2.1 million from UNDP, which they used to upgrade their plant culminating in WHO pre-qualification. CAPS on the other hand leveraged cross-shareholding with Fredex Financials to receive a loan for re-tooling (see section 6.2).

The companies are, however seeking long-term loans collectively in the range of USD 12 million to a maximum of USD 22 million (see Table 6.3). These funds are being sought through the ZETRAF facility, which currently is only funded at USD 70 million but has been hamstrung because the local bank through which the funds were channelled by the Ministry of Finance and Afreximbank was placed under curatorship for corporate governance deficiencies as some directors are alleged to have allowed excessive insider loans[27]. The government is trying to recover the funds. There was no FDI into the sector. No international pharmaceutical companies operate in Zimbabwe, which explains the dearth of FDI. In the current economic environment and the indigenisation drive it is highly unlikely that FDI may be a source of capital for technology imports.

[27] http://www.herald.co.zw/index.php?option=com_content&view=article&id=46093:rbz-tasked-to-recover-us47m-interfin-owes-govt&catid=37:top-stories&Itemid=130, accessed 5 July, 2012

For working capital finance, the pharmaceutical companies accessed working capital finance from banks but depended more on their own internally generated resources to finance day to day operations (see chapter 5 and 6). As in capital investment finance, the pharmaceutical companies do not source working capital finance separately for ARV manufacturing. The funding is sourced for the total portfolio of products they manufacture (see chapters 5 and 6). CAPS pharmaceuticals accessed short-term loans of USD 5.9 million at a weighted average interest rate of 20%, as at end of year 2010 (see table 6.2). Another pharmaceutical company accessed USD 2.3 million out of USD 6.7 million short-term lines of credit, at an average interest rate of 14 to 18% per annum (see Table 6.5). Another pharmaceutical company only revealed that they currently have a short-term line of credit of USD 500K and did not disclose their outstandings on that short term line of credit.

The cost of bank funding is very high, on average interest rates range from 16 to 30% per annum. The banks charge high interest rates and enjoy very high interest spreads, winning both ways, as they pay no deposit interest but charge high lending interest. In addition, banks short date lending facilities to collecting management fees more frequently. They use this strategy to increase their non-funded revenue streams. Consequently, pharmaceutical companies, wherever possible prefer to use internal funds to minimise expensive bank finance. The expensive bank finance has caused operational problems for CAPS, as the local short-term loans (about USD 5.9 million in 2010) from local commercial banks have been called up. The banks have sought court action to auction the company's fixed properties to recover their funds. CAPS argued that expensive bank finance at a weighted average interest rate of 20% per annum had choked their operations (see section 6.3).

Trade credit, a possible source of working capital finance advanced as in-kind finance by suppliers of goods and services is not available (see section 5.3). The pharmaceutical companies have low bargaining power with Indian and Chinese suppliers of active pharmaceutical ingredients (APIs) and excipients. They pay in advance for the raw materials, locking up capital for as long as four months at a time. As the pharmaceutical companies give their buyers credit terms, they finance their buyers (see section 5.4). The pharmaceutical companies finance their suppliers; a perverse

subsidy to big suppliers. By financing their buyers, their cashflows are severely constrained pushing them to access expensive bank debt for working capital requirements.

I now address research question 2 in section 9.4.2.

9.2.2 Research question 2: Chapters 5 and 6

In this section, I discuss the key findings from chapters 5 and 6 that *address research question 2.*

The banks played no role in capital investment, signifying a failure to finance technological capability upgrading, and product and process innovation. The situation may change as facilities such as ZETRAF (Zimbabwe Economic Trade Revival Facility) a joint venture between the Ministry of Finance and Afreximbank channels long-term funds for recapitalisation through local commercial banks. The other option for capital investment financing is regional banks with the ability to leverage their reputation on international markets and borrow funds for on-lending to local enterprises via local banks or directly (see chapter 6).

As for working capital finance, banks played an active role; however, pharmaceutical companies argue that the interest rates and other charges are exorbitant. In the case of CAPS, the banks called up their short term loans after CAPS failed to service its debts. CAPS on the other hand argued that the exorbitant interest rates of 20% per annum were too onerous and choked their operations. Commercial banks in Zimbabwe favour short-term finance and avoid long term financing (see section 2.7 and chapter 6). The banks charge very high interest rates, enjoy high interest spreads and lend very little citing adverse selection and moral hazard issues, whereas the politics of lending

explains why they prefer transactional banking to traditional lending as they avoid risk, maturity and liquidity transformation activities involved in lending (see section 6.5).

9.2.3 Research question 3: Chapters 5 and 6

In this section, I discuss key findings from chapters 5 and 6 that address research question 3. In addressing research question 3, I start with the technological capabilities around accessing finance at pharmaceutical companies then move to the situation in banks.

Pharmaceutical companies failed to access offshore long-term finance because of lack of project finance capability (see section 5.5). Other Zimbabwean enterprises and pharmaceutical companies in Uganda, Kenya and Malawi raised long-term finance from PTA Bank. Project finance capability is critical for accessing financial resources for technological capability upgrading through importation of plant, equipment and machinery. Executives in pharmaceutical companies failed to initiate links with financiers and within the economy. Lack of linkage capability in exchanging knowledge and information with the financial sector resulted in the executives not being aware of regional opportunities to access long-term loans for importing technology.

In chapter 1, I argued that literature on finance tends to focus on finance aspects of banking and an innovation lens to the best of my knowledge had not been used to unravel the technological capabilities surrounding loan origination. I proceeded to map Lall's (1992) firm level technological capabilities framework developed for the manufacturing and productive sector to the financial services industry. In section 6.4 and Table 6.6, I demonstrated that Lall's (1992) firm level technological capability framework could be mapped across to Zimbabwean financial institutions to demonstrate the complexities and technological capabilities surrounding financing ARV manufacture. Table 6.6, shows firm level technological capabilities surrounding assessment,

risk analysis, approval, disbursement, monitoring, and control of a project finance loan in a bank include project finance capability, investment capability (pre-investment and project execution), process engineering, product engineering, and linkage capability, demonstrating technological capabilities required by banks to advance loans. This is one of the complexities that I had argued was ignored in contemporary discourses. The discussion in section 6.4 shows that Zimbabwean financial institutions are facing serious challenges in the level of expertise and experience in these technological capabilities surrounding project finance appraisal, approval, disbursement, monitoring, and control, as the institutions lost old timers and merchant banks.

In the next section, I turn to research question 4 in section 9.4.4.

9.2.4 Research question 4: Chapter 6

In this section, I discuss the key findings from chapter 6 that address research question 3. I propose the politics of lending as an additional explanation, to moral hazard and adverse selection, of why Zimbabwean banks and by extrapolation, African banks lend so little, at high interest rates and high interest spreads. In section 6.5, I discussed how bank ownership drives strategy for revenue stream preference with non-funded income (fees and commissions) taking prominence over risk income (lending income) for international banks. They prefer that operational costs be covered by non-funded income from non-risk based activities. Consequently, this promotes transactional-based banking activities over traditional lending. Banks argue that lending activities, considering risk weight adjusted capital measures chew capital and should be avoided (see section 6.5.2). This model, driven by institutional policy on revenue strategies of commercial banks is implicit credit rationing, and encourages managers to prefer less risky business. Thus, politics of lending can impact credit allocation to pharmaceutical companies which are locally owned, small to medium enterprises that require the heavily weighted lending assets. A micro level institutional policy rations credit via capital utilisation strategy and risk-reward metrics; a politics of lending

explanation for low lending by African banks. This may be one of the explanations for Allen *et al*'s (2008) findings that average credit extended to the private sector in Africa was 15% of GDP compared to 28 to 45% for other developing regions, in addition to the classical moral hazard and adverse selection theses.

The second issue on politics of lending relates to borrower company ownership and market segmentation. Foreign owned banks are inclined to favourably consider subsidiaries of multinational companies, especially subsidiaries of MNCs that the international banks have a global relationship with.[28] Subsidiaries of MNCs have greater chances of accessing credit because of credit assessment tools setup in banks, which allocates better credit rating to subsidiaries of MNCs (see section 6.5.1). The credit score or credit grade determines premiums on interest and resultantly local companies are likely to pay higher premiums above the base lending rate, and management fees compared to subsidiaries of MNCs (see section 6.5.1). As such, credit policy setup may be a hurdle to accessing financial resources.

9.2.5 Research question 5: Chapters 5, 6 and 7

In this section, I discuss the key findings from chapters 5. 6 and 7 that address research question 5. Financing of local manufacture occurs in certain policy contexts and national technological capability frameworks. At firm level, investment, production and linkage capabilities determine the success of a company (see chapter 5). Operation of these different levels of capabilities are driven by policy regimes, implying when there is policy or practice failure at national technological capability level, there has to be a compensatory reaction at a firm level technological capability. This usually manifests in investment in complementary infrastructure (see section 7.2.1), and policy and practice gridlocks. Gridlocks can be caused by policy, practice, and capability failures at national level, forcing firm level compensation. This inevitably impacts financiers' appetite for ARV manufacturing risk.

[28] Interviews held in Zimbabwe and practice as a banker working in both corporate and retail banking from 1999 to 2006.

Pharmaceutical companies purchased standby generators to ensure consistent supply of electricity (complementary capital), and sunk boreholes to ensure consistent water supplies, diverting funds from productive activities (see chapter 5). In addition to physical infrastructure failure, the incentives and institutional support that Lall (1992) advocates for, are lacking in Zimbabwe making the business and operating environment hostile to financing ARV manufacture (see chapter 7).

Financial institutions' credit policies, underwriting standards, capital utilisation strategies, and risk-reward remuneration policies impact credit allocation to the pharmaceutical industry. Credit policies and lending technologies, which prefer short-term finance and encourage revenue streams from non-interest incomes as opposed to interest (risk) incomes, is implicit credit rationing. For banks, policies at micro level de-emphasised merchant banks and pushed commercial banks to dominance. This shrunk a critical development space for capital investment as the financial system became short-termist, preferring to finance trade and commerce at the expense of capital investment. Using the politics of lending lens I proposed an additional explanation to why banks lend little.

Working together at policy and practice level, infrastructure failure, poor incentives, limited product portfolios, skewed import policies, lack of supporting strategies for local production, low financial deepening, policy conflict and policy misalignment contribute to pharmaceutical manufacturers struggling to access funding (see chapter 7). Financiers view such a business and operating environment as not being conducive to business viability and profitability that can support long-term finance.

9.3 Limitations of the Study

The main limitations of a PhD study are resources and time, which necessitate a streamlined focus on the subject area and limited period of study. Additionally, I was not able to access financial statements for the privately held companies, which could have painted a richer picture of the financing story and financial health of the companies. I was also not able to access a company that used to manufacture ARVs but has since stopped manufacturing them. This company would have provided an interesting aspect of the challenges they faced. This however does not take away from the main thrust of understanding the source and cost of finance for ARV manufacture in Zimbabwe, as I was able to access executives in the pharmaceutical and banking sectors to build a rich story of the financing of ARV manufacture for the company that is currently manufacturing ARVs. I also accessed two pharmaceutical companies that are not manufacturing ARVs which enriched the study further on challenges to local ARV manufacture. Where financing data was not availed, the executives provided candid responses to explain the story.

This research done on Zimbabwe, a former British colony with essentially a British financial system still evident and just emerging from hyperinflation and an economic meltdown has its own peculiarities and the findings' applicability to other African countries could therefore be debateable. However, I have taken the view that the Zimbabwean scenario provides an accelerated window that precipitates a hight number of things that can go wrong and as such it provides a unique opportunity to understand the myriad challenges that African countries face in financing technological capability upgrading and innovation in local pharmaceutical manufacture.

9.4 Implications for Policy

In as much as this study focused on finance and innovation; chapters 5, 6 and 7, demonstrate that finance is part of an integrated system, with other issues such as technology, technology transfer,

human capital, ease of doing business, economic development, macroeconomic stability and trade policies. For example in chapter 5, finance was described as being part of a number of fundamental issues that need to be addressed as finance by itself is not the panacea. In addition, technological capabilities surrounding financing of ARV manufacture are likely to permeate other economic sectors, hence a systems approach would yield better results.

In other words technological capabilities surrounding financing of local pharmaceutical manufacture do not operate in isolation but should be approached as a component of a system of national innovation (Adeoti, 2002; Christensen, 1992; Lundvall, 1998; 2007; Ernst and Lundvall, 1998). The piecemeal approach of considering issues surrounding local pharmaceutical manufacture in silos, separate from health, industry, training institutions, tertiary educational institutions, technology, economic development and industrial development will not yield significant strides in technological capability upgrading and technological effort.

I now turn specifically to the policy implications for financial systems and building capabilities in sections 9.4.1 and 9.4.2 respectively.

9.4.1 Financial architecture that supports industrial finance

This study has shown that the current Zimbabwean financial architecture is not geared to financing industrial development, but trade and commerce. Reliance on FDI and foreign loans worked in the past, but there is a need to build capabilities to finance industrial development using local resources. I am cognisant of the dichotomy in the types of savings required to finance importation of plant, equipment, and machinery. As I argued, the critical savings that are required for importing technology are foreign currency savings. With the systems approach that I advocated for, it is then important for the country to earn foreign currency from exports and build adequate import cover. The second implication for policy would be to support syndicated lending with

offshore banks and promote the institutional arrangement innovation of the Afreximbank-ZETRAF facility. At this juncture, realistically, local savings cannot finance industrial growth and technological capability upgrading. In the interim, the Afreximbank-ZETRAF model provides a possible approach to financing industrial development not only in Zimbabwe but also in Africa.

Domestic savings are important for financing local requirements and should be encouraged, and they would work well if backed with foreign currency reserves. If foreign currency is readily available, the same domestic savings can be used to import plant, equipment, and machinery. Pharmaceutical companies could access local long-term loans and use the portion that they require to import technology by purchasing foreign currency on the market. In doing so they avoid foreign currency risk by locking their liabilities in local currency. However, this is premised on foreign currency being freely available on the market. Commercial mortgage finance should be encouraged as it plays a role in building a platform for industrial development.

From a policy perspective there is a need to encourage financial institutions to start lending long-term. However as argued earlier in the study, this is driven largely by macroeconomic and political stability as well as predictability.

9.4.2 Support for building capabilities

From an incentives and capabilities development approach, the role of the state is critical for creating an enabling environment. Wade (2009) points at the resurgence of industrial policy, and suggests the Industrial Development Bureaus (IDB) model of Taiwan. Cognisant of the different contexts and nuances between Taiwan and many African countries, there still are certain aspects such as extension using experts in engineering, accounting, marketing and other sectors to encourage and stimulate product and process innovation in conjunction with fiscal incentives (tax deductions, accelerated depreciation and trade tools) for temporary protection with clear sunset

clauses. This may stimulate local capabilities in manufacturing, at the same time it may foster competitiveness.

What is important is that there needs to be a coordinator for building capabilities for technological capability upgrading. And Wade's (2009) suggestion of the IDB seems a feasible option. A piece-meal approach to building capabilities is unlikely to have an impact on technological effort and innovation capacity.

9.5 Implications for Theory

This study contributes to theory from three fronts. The first contribution of this study is that it is the first of its kind in Zimbabwe and to the best of my knowledge in Africa that links finance and innovation by considering the technological capabilities surrounding financing of local pharmaceutical manufacture. Secondly, it is the first study to gather empirical evidence on the politics of lending and thirdly it is the first to map Lall's (1992) firm level technological capabilities to the financial services sector to unravel the complexities surrounding loan origination.

9.5.1 Project finance in Lall's (1992) technological capabilities framework

I argued in chapter 3 that the definition of firm level technological capabilities should be expanded to include project finance capability. However, project finance capability is linked to investment capability. Lall (1992) may have omitted project finance capability by mentioning without delving into details that efficient financial systems were essential for garnering financial resources for physical investment. However, African financial systems are anything but efficient. The incorporation of project finance capability in the firm level technological capabilities can assist in unravelling skills necessary to finance technological capability upgrading. This will enrich the

local pharmaceutical manufacturing debates by purposively linking project finance capability with the ability to garner financial resources for importing plant, equipment and machinery.

9.5.2 Financial services sector using Lall's (1992) technological capabilities framework

Another theoretical contribution is the demonstration that the firm level technological capability framework can be mapped across to a firm in the financial services sector. This may provide a conceptual framework to analyse the financial services firm using Lall's (1992) firm level technological capabilities with some modifications. I applied Lall's firm level technological capability to the financial service firm specifically the lending business, focusing on loan origination.

9.5.3 The Politics of Lending

Lastly, the study introduced the politics of lending perspective as an additional lens for explaining why African banks lend so little at high interest rates and huge interest spreads. The politics of lending lens augments the moral hazard and adverse selection explanations by authors such as Allen *et al*, (2011), Andrianova (2010; 2011a; 2011b) and Nissanke (2001). The politics of lending uses financial intermediation theory to ascertain which activities financial intermediaries engage in providing a window to understand bank behaviour towards lending.

9.6 Future Research

For future research, I observed an interesting phenomenon of institutional or organisational arrangement innovation between Afreximbank and Ministry of Finance that has allowed long-term finance to be made available for recapitalisation. This institutional or organisational innovation is

similar to health Product Development Partnerships (PDPs) (Chataway *et al.*, 2009, 2010) that have been used as brokers and facilitators to allocate resources into research and development activities for diseases for the poor. It would be interesting to compare and contrast the organisational innovation from a social technology perspective, and ascertain whether this could be a way to make long term finance become accessible to resource limited African countries in as much as PDPs are being promoted to address neglected diseases and cater for the poor (ibid). This study demonstrated that sub-Saharan Africa generally does not have local resources to finance technological capability upgrading and innovation. The institutional arrangement innovation provides a possible vehicle for financing sub-Saharan industrial development and needs to be investigated further.

The second avenue for future research that this study opens is the politics of lending lens. It may be interesting to investigate the prevalence and depth of this phenomenon in other African countries.

9.7 Conclusion

In chapter 1, I argued that there is an elephant in the room; the financing of African local pharmaceutical manufacture. I proceeded to argue that financing of local pharmaceutical manufacture was a critical component of African local drug production and should be incorporated into discourses on economies of scale, technology, technology transfer, and human capital. I argued that contemporary discourses on financing local manufacture scratch the surface and make it an issue of just providing finance, whereas there are complexities and technological capabilities required at pharmaceutical companies to access project finance, especially foreign currency project finance to import technology for technological capability upgrading. Banks as well have complexities and technological capabilities surrounding project finance assessment, approval, funds disbursement, monitoring, and control of the advanced loans. I further argued that there is a

politics of lending dimension that has not been discussed in contemporary discourses as well as how national technological capabilities interact with firm level technological capabilities to influence the business and operating environment. Failure at practice and policy level of national and technological capabilities, impacts business and operating environments. This drives financiers' appetite for risk in terms of lending to local pharmaceutical companies.

I have demonstrated that financing of local pharmaceutical manufacture is a complex issue. This study unravelled project and linkage capability challenges faced by pharmaceutical companies in accessing financial resources for technological capability upgrading. The long-term loans needed are foreign currency loans to import capital equipment (the physical embodiment of technology) (Dailami and Walton, 1989). Many African countries do not have efficient financial systems and the local commercial bank dominated financial systems are not geared to finance foreign currency long term loans. Project finance and linkage capabilities are key technological capabilities required to access financial resources.

What is critical at this stage is to realise that debates on African local pharmaceutical manufacture need to consider the sources of finance for working capital and capital investment if technological capability and innovation is to be accelerated. Assuming that there are efficient financial systems and that investment and project finance capabilities exist in the pharmaceutical and banking industry would be erroneous. There is a need for realisation that the pharmaceutical manufacturing companies fight for the financial resources to upgrade technological capability with other economic sectors and they need to build effective linkages that enable them to access the appropriate resources for industrial development. For policy makers this study has shown that there are politics of lending at play in the banking sector and that there are no local foreign currency savings to finance long term investment. Institutions arrangement innovations such as the ZETRAF fund provide a window to financing industrial development.

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11: Appendix

Interview guide and Consent Form

- I am conducting a case study of how ARV manufacture was financed in Zimbabwe.

- To do this I am conducting discussions with a number of organisations who are involved in the financing, manufacture and procurement of ARVS including your organisation.

  - I am interested to know about:

    a. Banking relationships and credit facilities to pharmaceutical companies.

b. Financing of working capital requirements, machinery, equipment purchases and factory upgrades.

c. Source of funds and procurement policies of purchasers of locally manufactured ARVs.

- The interview should take approximately one hour, please ask at any time if you would like clarification on any aspect of the interview.

- Information collected in the interviews could be pooled with information from other informants and attributed to a named group of actors e.g. policy makers or used to express anonymously the views of informants.

  - I will not attribute anything in the report to you personally.

- You can go "off the record" and "on the record" at any point during the interview and you can terminate the interview at any point. Information given off record will not be recorded and will not be reported.

  - You can also withdraw from participating in the research.

- The information I receive from these interviews will go towards my PhD thesis. I will also try to disseminate the findings further e.g. in a journal. Transcripts of the interview will be sent to you after within 30 days after the interview.

- Any ideas that you have regarding the research would be very helpful. Please mention them at any point.

- Do you have any comments on these uses for the information? How would you like me to use the information?

- You can get in touch with my supervisors if there are any issues you may want to discuss.

Professor J. Chataway (j.chataway@open.ac.uk), Dr R. Hanlin (r.e.hanlin@open.ac.uk) or Dr R. Simonetti (r.simonetti@open.ac.uk).

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Finance

1. How many banks/financial institutions do you have a lending relationship with?
2. Are there any other banks that you use for deposits only?
3. How did you finance ARV manufacture at:
    a. Project proposal stage
    b. Implementation stage
    c. Import of machinery
    d. Current day to day operations
4. How much did you spend on machinery imports for ARV manufacture from 2002 to date?
5. Did you get any short term loans (up to 1 year loans) from financial institutions from 2002 to date: be thy Overdrafts, Bankers Acceptances, Short Term loans, Guarantees, or Letters of Credit amongst others?
    a. What were the amounts (even in Zimbabwe dollars)?
    b. What were the interest rates?
    c. What was the management fee charge?
    d. What were the draw-down and establishment fees?
6. Did you get any medium term loans (2 to 4 years loans) from financial institutions from 2002 to date?
    a. What were the amounts (even in Zimbabwe dollars)?
    b. What were the interest rates?
    c. What was the management fee charge?
    d. What were the draw-down and establishment fees?
7. Did you get any long term loans (5 to 10 years loans) from financial institutions from 2002 to date?
    a. What were the amounts (even in Zimbabwe dollars)?

b. What were the interest rates?

c. What was the management fee charge?

d. What were the draw-down fees and establishment fees?

8. Did you use your own resources for machinery imports and plant refurbishments?

   a. How much was it?

   b. What was it used to purchase?

9. What proportion of your foreign currency needs to did you manage to get in the period 2002 to date?

Research and Development

1. What are the current R&D activities in Zimbabwe?
2. Which aspect of R&D costs the most?
3. How do you manage bio tests for ARVs?
4. How do you manage drug registrations for ARVs in Zimbabwe?
5. Are there sufficient legal skills in Zimbabwe to handle drug registrations and challenge patents?
6. What are the effects of TRIPS on local R&D on ARV drugs?
7. Do you have any joint venture initiatives with companies such as Roche for technology transfer in ARV manufacture?
8. How have you managed to keep abreast of recent developments in ARV manufacture technology?
9. How have you managed the skills flight issue?
10. What is the future of R&D at Varichem specifically and in Zimbabwe generally?

Procurement

1. Who are the main suppliers for ARV raw materials?
2. What is the spread of the suppliers geographically?
3. What are the terms of supply?...Open terms, 30,60, 90 days or advance payment?
4. Do you get any benefits/incentives for paying in advance or earlier?
5. Do you have any power when negotiating prices with suppliers?
6. What are the lead times on the different supplies?
7. Which raw materials account for the greatest value?
8. Which raw materials account for the greatest volume?

Logistics

9. How do you handle customs clearance?
10. Do you have an in-house team or do you outsource?
11. Is the duty structure and VAT systems advantageous to you as an industry?
12. What are the bank charges for handling import/export documents?

1. What is the estimated market size for ARVs in Zimbabwe and the region?
2. Who are your customers?
3. What is the spread of the customers geographically?
4. Do you have a regional/international thrust?
5. What are the factors that you consider in the pricing of ARVs?
6. Do you get a price preference of up to 15% by local purchasers?
7. It has been reported that Indian pharmaceutical companies generally display more interest in the more lucrative North American and European markets.
    a. Which section of Indian pharmaceuticals companies (big, medium or small) is in direct competition with local pharmaceutical industry on ARVs and other drugs?
    b. Do you have local competitive advantage in local and regional markets for ARVs?
8. How do you manage competition from Indian and Chinese imports?
9. Does the fact that health insurance seems low affect the volume of sales of drugs in Zimbabwe, especially ARVs?
10. How do you manage the sales/tender process?
11. How do you manage your distribution costs?
12. Do you have a Relationship Management model for your sales process?
13. How successful have you been with WHO, Global Fund and PEPFAR tenders?
14. What are your sales terms?
    a. Open account?
    b. Advance payment?
    c. Letter of Credit backed orders?
    d. 30 days?
    e. 60 days?
    f. 90 days?

Production

1. May you please briefly describe the process of manufacturing ARVs.
2. What are the critical inputs and how do you manage them?
3. What process/item(s) account for the largest cost of production?
4. What is the average age of your machinery and how much lifespan is left?
5. Have you refurbished any machines and increased the lifespan?
6. What is the historical and current cost of maintenance?
7. How did you achieve GMP and WHO pre-qualification standards?
8. What is the cost of compliance?
9. How are you handing the issue of skills challenges?
10. What do you need to increase productive capacity?
11. What do you need to become world-class and compete with international pharmaceutical companies?
12. How are you ensuring technology transfer?

The Open University

From Dr Duncan Banks
Chair, The Open University Human Research Ethics Committee
Email d.banks@open.ac.uk
Extension 59198

To Geoffrey Banda, DPP
Subject *'Financing of Antiretroviral drugs (ARV) Manufacture in Zimbabwe: A Case Study.'*
Ref HREC/2011/#872/1
Red form n/a
Date 25 February 2011

Memorandum

This memorandum is to confirm that the research protocol for the above-named research project, as submitted to the review panel on 4th February 2011, **is approved** by the Open University Human Research Ethics Committee **subject to** addressing the following comments from the reviewers;

1. On the subject of consent could you justify the two-tiered approach? You are accepting verbal consent if written consent is declined. If you consider verbal consent is sufficient, then this can be used for all participants.

2. Under anonymity/confidentiality the statement *"Unless consent has been given no quote will be specifically ascribed to a named individual."* The reviewers do not accept that any quotes should be attributed to a named individual. Even if consent is given, the repercussions of this may not be anticipated (by the participant), and the benefit of disclosing identity in this way is too great, when weighed up against the risks. It would be easier to maintain both confidentiality and anonymity. It is not justified to state that *"In the event that confidentiality agreements and anonymity are required these will be observed with strict adherence."* It should not be necessary to breach a confidentiality/anonymity agreement, and to do so would go against most ethics guidelines.

3. There seems to be some confusion over data protection. You have stated that *"No personal data will be processed for this research"*, but the interview transcripts will generate personal data, and potentially other data obtained from documents will be considered 'personal'. Could you clarify this section of the proforma? You also need to discuss how you will ensure the security of data once it has been collected.

4. How will participants be debriefed? Will this be immediately after participating?

5. In the interview guide/informed consent information the statement 'not linked to informant' is mentioned. Does this mean some data will be linked to participants? How will the identity of participants be protected?

6. The application mentions *"off record"*. Is this information that will be destroyed and not used as data?

7. There is no mention of withdrawal. This needs to be added to the documents that participants read and/or sign.

8. Ideally there should be an independent name/contact for people to discuss issues or concerns.

Please address each point in turn and a) attach any documents that are required to be altered or b) any additional documents requested. We will make every effort to respond quickly to your reply. The OU reference number **HREC/2011/#872/1** should be used in all further communications.

At the conclusion of your project, by the date that you stated in your application, the Committee would like to receive a summary report on the progress of this project, any ethical issues that have arisen and how they have been dealt with.

Duncan Banks
Chair OU HREC